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Review & comment by 8/30.

WASTE MINIMIZATION PLAN

LENOX CHINA MANUFACTURING DIVISION, POMONA

June 28, 1993

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Executive Summary

This document is the Waste Minimization plan for the Lenox China Facility in Pomona, New Jersey. The operations primarily described at this time are those which are known or likely to produce a hazardous waste. Only these have been listed at this time to focus attention on the generation of hazardous wastes. However, other types of significant waste generation are also addressed.

Lenox has been internally recycling in its processes and minimizing process wastes for over twenty years. This is particularly true in the manufacture of lead crystal glass and china glazes due to the high cost of the raw materials and the processes to produce these contaminant free materials. With the advent of hazardous waste regulations and the associated costs of disposing of hazardous wastes, Lenox began to segregate lead containing wastes to improve control of the wastes and minimize constantly increasing disposal costs.

The Environmental Policy of the Lenox Manufacturing Division has been clearly stated by the Division's President and is included in this document.

The Lenox Manufacturing Division has adopted a Total Quality Lenox (TQL) policy. The TQL Policy and its principles apply in its entirety to waste minimization. The TQL committees will be the framework for implementing this waste minimization plan which is included in all education and training for process and operational improvement planning.

Specific Hazardous Waste generating processes and operations are individually addressed in a narrative form. The current state of understanding of these operations is presented along with a summary of the volumes of waste being generated and the costs associated with their disposal. Current or suggested plans are presented to investigate alternative processes, process improvements, substitution or elimination of the hazardous constituents, recycling, waste stream segregation, housekeeping improvements, preventive maintenance and/or operator training.

A detailed plan is presented which prioritizes waste minimization activities and specifies goals and dates for achievement of the waste minimization steps in this plan. Specific individuals and departments have been made responsible for implementation of the plan and are required to routinely report their progress in implementing the plan. The requirement for continuous and periodic review and amendment of the plan is detailed in conjunction with tracking and periodically evaluating program effectiveness using appropriate measures of production and setting criteria for achieving effective waste minimization.

Waste Minimization Plan

Current Revision: June 28, 1993

1 Introduction

1.1 Facility Location and Description

Lenox China's manufacturing comes under the Industry Group Code, SIC 3262. The facility is a modern, slab on grade, single-story structure on 56 acres of level land in a rural area. The Lenox facility began operation in 1954 and initially had 145,000 square feet of manufacturing area and 8,000 square feet of office space. additions to the facility have brought this to 346,000 square feet of manufacturing area and 23,000 square feet of office space with another 45,000 square feet of separate warehouse and other miscellaneous outbuildings. Operations at the facility include the manufacture of fine china tableware and giftware. The facility employees approximately 1,100 people and is served by public sewer, electric and gas. Water is supplied to the plant by two on-site wells owned by Lenox. Treated industrial waste water is discharged directly into the Jack Pudding Branch of the Babcock Swamp under a NJPDES-DSW permit.

The facility is one of only two large manufacturing plants in Atlantic County. Until recently the County had little existing formal infrastructure for the collection and disposal of residential and commercial trash much less industrial trash. The State of New Jersey Pinelands Commission recently closed all land fills situated in the Pinelands. This includes a significant portion of the County. As a result there are only a few small landfills available in the county and these are either owned and operated by small municipalities or dedicated to the disposal of bulky waste such as construction demolition materials. The County has therefore established an infrastructure for the collection and disposal of trash and landfills most of its non-recyclable trash in Pennsylvania. The cost per ton of trash is so high as to immediately cost justify almost any practicable recycling technology. Individual manufacturers and institutions are permitted to contract for their own recycling but are legally mandated to deliver all trash to the Municipal Utilities Authority Transfer Station for landfill disposal. Lenox has therefore instituted an in-house segregation and collection system for trash and recyclable wastes.

1.2 China Manufacturing Operations - The following operations have been identified as the operations which potentially produce hazardous wastes. Only these have been listed at this time to focus attention on the generation of over 90% of the hazardous wastes. Each operation has been described in relation to its purpose and the hazardous waste which is generated. This is followed by a discussion of the factors which presently require the use of the hazardous substance and some of the opportunities which might be pursued to reduce or eliminate the use of the hazardous substance. Following that is an estimate of the costs for handling the hazardous wastes generated by the process. This estimate includes, in so far as possible, the total

environmental costs for: the value of the material lost, segregating, collecting, treating, storing and disposing of the hazardous waste, and any permit fees, management or consulting costs.

1.2.1 Fine China Glazing - Bisque fired china has a fine matte surface which collects dirt easily, has little gloss and is generally unacceptable for use as table or giftware. The addition of a glassy glaze coating which completely envelopes the piece provides a smooth, high gloss surface which does not attract or hold dirt or other films and is excellent for the application of fine china patterns and precious metal decorations. Traditionally, a high lead glass has been used for this glaze coating due to its high index of refraction and excellent clarity which lets the color of the body show through. Also, this glass composition, which includes zinc, permits complete fusing of decorations and precious metals without bleeding at the margins and permits a full color pallet to be achieved.

Lenox is well aware that other china manufacturers have successfully made and marketed their products based on leadless glazes; however, fine china manufacturers have frequently found it necessary to produce at least part of their line using leaded glaze to retain the required level of quality and consistency in their products. This is especially true for Lenox China with its marketing dependence on the translucency and color of its ware and the long market cycles inherent in a household's purchase of a china pattern over a decade or more. This requires that there must be no discernable variation in the appearance of the ware under a variety of lighting conditions. Lenox has developed and marketed new lines of china several times recently and is currently marketing lines of china based on lead free glazes.

A switch to leadless glazes for the Lenox Ivory line will require a complete revision of the manufacturing process and its many involved steps to assure that each step is compatible with the previous one. It would be simpler to develop and market a totally new line of china if it were not for the loss of product recognition and perceived value. The requirement is therefore to develop a leadless glaze which cannot be easily detected when compared side by side with the current product and is largely compatible with all current production processes. Lenox is committed to developing such a glaze.

The cost to dispose of the 309,000 pounds of lead characteristic hazardo
glaze sludge generated in 1992 in the following process steps was $45,00
loaded costs (raw frit, processing into glaze, operation of glaze waste t
system and disposal) for collecting and treating glaze waste water was appro

309000 = 154.5
2000

Table Slugs
16.6
tons

$200,000. The zinc portion of the composition does not affect hazard classification at this time. No mechanism currently exists for prorating waste water treatment costs to the individual operations, however there is no obvious reason that this should not be done with the installation of water submetering equipment.

1.2.1.1 Batching - The lead glass or frit is purchased as a glass flake formulated from lead-bisilicate which is very stable and highly resistant to leaching by acids at normal temperatures. The frit is milled to a very fine particle size distribution along with mill additions of clay, binders, etc. to produce a creamy water suspension which is also called glaze. Batching is accomplished by weighing a proprietary formula of frit and other materials into a batch hopper(s) at the Slip House batch scale. The weighed materials are then taken to a separate, enclosed area of the plant and the contents of the hopper are transferred by gravity into a ball mill under the influence of a dust collection hood. An exact proportion of water is added to the mill before sealing it tightly. The mill is turned for about six hours or until the required fineness of grind has been achieved. The glaze is then pumped out of the mill to a storage tank for further processing. All equipment washdown water from this isolated area is collected and sent to the glaze waste water treatment system.

Care in the handling of raw batch materials and glaze minimizes the amount of waste and washdown water produced from this area. The inclusion of unleaded glaze milling and waste glaze filter pressing in the separated glaze milling area prevents the recycling of glaze from the waste water due to cross contamination. However, the total volume of material processed does not appear to justify further isolation. Also the risk of glaze contamination from other process fugitive dust and machinery wear particles and grease makes the risk to product quality too great to permit recycling. In the past, clean wash water was collected and stored and used as part of the water required to make a batch. Care in the amount of water used for equipment cleaning has minimized the waste water volumes.

Costs can probably be assigned to this operation in proportion to the water used, excluding batch formula water.

1.2.1.2 Application - Glaze material is applied to the surface of the ware by spraying, dipping or flushing in a fountain. The glaze is continuously circulated to maintain a consistent composition and screen out dirt. Ware which is incorrectly coated is rinsed off in containers placed in the area for that purpose

and the water is returned to the glaze area for recycling. At the end of a shift or a week's production run, the glaze is pumped out of the application equipment into a storage tank. Particular care is taken to remove all of the glaze without diluting or contaminating it. The equipment is then washed down and the washdown, spindle cleaning and scrubber waters are pumped into containers and delivered to the Slip House for recycling as a normal part of the process.

Glaze which has splashed or leaked to the floor or outside surfaces of the process equipment is considered to be contaminated and is washed into floor pits to be pumped to the Glaze Waste Treatment System. Dedicated sinks are provided in the department for washing equipment and rinsing out mops used to keep the area spotlessly clean. Employees also wash at these sinks before leaving the area. The water from the sinks is piped directly to the Glaze Waste Treatment System.

Care in the maintenance and operation of the equipment prevents glaze from becoming contaminated and minimizes the volume of waste washdown water to be treated.

Costs can probably be assigned to this operation in proportion to the water used .

1.2.1.3 Glaze Recycle - Overspray, spindle wash, ware rinse water and glaze cleaned out of the equipment after a production run are recycled to minimize production of wastes. Recycling involves flocculating the diluted glaze, filter pressing, and the addition of dried glaze portions to produce a whole glaze ready for application to ware in production. It is an integral part of the production process and essential to economical operation.

Care in processing the glaze to be recycled and the maintenance and cleaning of the equipment minimizes the generation of waste washdown water.

As any water used in this operation is common to the Glaze Batching operation, no assignment of waste handling cost to this operation is foreseen at this time.

1.2.1.4 Foot cleaning - After applying the glaze, it is necessary to remove any glaze which coats the foot of the piece to prevent fusing the piece to the kiln furniture during glost firing. This is done by carefully wiping the foot with a

sponge or scraping the excess glaze off with a sharpened wooden stick (pencil). This process is completed over a downdraft table to minimize employee exposure to glaze particulate. The glaze removed falls into the table and is considered to be contaminated with bits of wood, sponge or rag and is not reused.

Foot cleaning has been nearly eliminated in the spraying process by setting the foot in a spindle ring which protects it during spraying. Dipping and flushing cover the entire piece and require removal of glaze from the foot. One possibility for eliminating this step would be to precoat the foot of the piece with a hot wax which would not take the glaze and would burn away during glost firing. Another waste minimization approach might be to decontaminate the glaze scraped from the foot by floating and skimming the wood, sponge and rag matter from the scrapings during recycling.

Costs could be assigned to this operation for the value of the material lost and a portion of the TSD facility disposal costs.

1.2.1.5 Glost Firing - Ware with a coating of glaze is placed on kiln furniture (setters) and processed through the glost kilns to fuse the coating into a glassy envelope. Any defective or broken ware after this point is non-hazardous and environmentally stable. Setters are automatically cleaned after each cycle to minimize the build-up of contaminants. From time to time it is necessary to manually remove setters from the kiln batt setups and store them while the appropriate setter for another china shape is used in production. Weakened setters often break at this point. The setters used in the kilns are both lightweight and tough, though brittle. Constant thermal cycling, deterioration from the lead atmosphere and glaze drips, and reprofiling weakens the setters and limits their life. Broken setters are non-hazardous and environmentally stable.

There is no known method of recycling these wastes within the china manufacturing operation. However, broken china and setters can be recycled as raw materials for manufacturing refractories, portland cement, and concrete and asphalt aggregate. Care in the operation of the process to maximize product yields is the only way to minimize these wastes. Setters are recut to remove glaze drips and surface glazing. Care in the handling of setters prevents premature breakage losses.

The only costs which can be assigned to this operation are the value of the china and setters lost and for trash handling/recycling.

1.2.2 Casual China Glazing - This operation is identical in all respects to Fine China Glazing. However, the glaze is leadless and it does not cause the generation of a hazardous waste although it does contain the heavy metals zinc and to a significantly lesser extent barium.

1.2.3 Decoration - The decoration of fine china is an inherent part of its manufacture and marketing and produces the many patterns required to appeal to the widely varied tastes of the consumer. Each of the decorating methods has been highly developed over many centuries of manufacture and improvements are now difficult to achieve, especially in light of the very high quality standard which defines fine china.

1.2.3.1 Decal Application - Decals consist of finely ground glasses which are generally silk screened onto a release paper and covered with a transparent transfer film. These ceramic decals contain very fine detail and shading variations and constitute artwork developed at great cost over many years. They differ from ordinary decals in that they are printed using inorganic materials such as ground glasses and precious metals which can be permanently fused to the surface of a fine china piece to become an integral part of the piece. The colored glasses used in this process are normally lead based to enhance their ability to bond to the glaze, enhance the spectrum of the colors available and to improve the stability of the colors during the high temperature fusing process.

Decals are ordered from a number of national and international sources and are stocked in relatively large quantities to assure adequate quantities for planned production and sufficient time to discover and correct lot to lot variations before new receipts are needed in production. Extensive pilot testing is required to certify each new lot or to qualify a different vendor. New patterns must be developed and certified for consistent results in the current manufacturing process. A major variable is the ability to achieve a pattern that is environmentally stable when fused to the fine china piece. Thus only one or two decal producers may be able to supply a given pattern.

Leadless decals have been developed by Lenox for both lead glazed ivory china and leadless china lines. Lenox continues to develop these patterns and to develop leadless versions of existing patterns. Given the enormous number of subtle color variations currently in use and the many proprietary processes by which decals are manufactured to produce the broad line of Lenox patterns, the

task of evaluating and certifying leadless versions of existing patterns for use on leadless china glazes is exhaustive. Lenox has committed to this long-time-frame task.

Decals which contain lead must be environmentally stable when fused to the fine china piece but may not be stable as decals. Decals which cannot meet quality assurance requirements must be destroyed to protect Lenox's proprietary interests and are normally returned to the vendor. Decals which either absorb too much water or become dried out in storage are unusable and must be destroyed by Lenox. Other decals may become damaged during application and are discarded. Most decals are environmentally stable, including those which contain lead. Rejected lots may be destroyed and disposed of as trash. Those lead-containing decals which are not environmentally stable are tested to determine if they are characteristic hazardous wastes and, if so, they are properly disposed of to a permitted TSD facility or to a precious metals reclaim facility.

When a lot of decals has been accepted for production, the individual decals are separated from the large printed sheets, hand trimmed and individually inspected for flaws before being released to production. Decals are applied to the china after being released from the paper backing in a water bath. The water from these baths may contain lead from some of the less environmentally stable patterns. Decal water is collected in a segregated drainage system, clarified to remove paper and organic film and the effluent is either passed through a deionization column or sent to the Waste Glaze Treatment System before being discharge to the POTW.

Waste minimization is an inherent operating philosophy in the Decal Department due to the high cost of decals and the intensive hand labor required to prepare them for production and apply them. Other than quality rejects, decal waste is proportionately small and little hazardous waste is generated in this operation.

Costs can probably be assigned to this operation in proportion to the water used and the TSD facility costs incurred.

1.2.3.2 Enameling - Enamels are made from ground colored glasses similar to those used to produce decals. They are used in decorating to produce raised dots in the pattern. Although some decals include enamel dots, enamels are usually hand applied at a separate point in the process after the decal has been fused

to the china. As a result, enamels are required to fuse to the china piece at temperatures at or below the firing temperature for the decals. Enamels are thus more likely to contain lead as a flux to promote complete fusion at a lower temperature. However, fine detail and resistance to bleeding is less of a factor and there is considerably more leeway in their formulation. Therefore, enamel development is more easily undertaken.

Few wastes are currently produced in the enamel operation other than rags and paper used to clean of equipment or remove misapplied enamels. Some enamels may be characteristic hazardous wastes if disposed of individually in quantity.

Costs can probably be assigned to this operation in proportion to the water used and the TSD facility costs incurred.

1.2.3.3 Etching - Very fine china patterns are produced with delicate relief patterns deeply etched into the glaze surface of the china. Such patterns would go unnoticed except for a rough surface in the etched area if not covered by a wider band of gold. Gold must be burnished after firing and the gold deposited in the etch pattern is not as easily burnished as the gold on the surface of the glaze. This results in a rich relief pattern.

Pieces are etched by using an asphalt based resist to print a negative of the pattern on release paper and transferring it to the china piece. Additional resist is then used to coat the entire china piece up to the edge of the pattern. The resist is then itself coated with hot microcrystalline wax. The ware is then immersed in a strong acid bath to etch away the uncoated portions of the glaze surface. The china piece is then removed from the acid and immersed in a strong caustic stop bath to neutralize the acid before rinsing in fresh water. The resist is then removed by lowering the china pieces into a vapor degreaser to melt the wax and asphalt and rinse the remaining resist from the china piece. After degreasing the china pieces are washed in an ultrasonic tank, rinsed with fresh water, dried and sent to the next process step.

The acid used in the etch process is neutralized by the caustic in the stop bath. Sludges which accumulate in the acid bath are removed from time to time and neutralized prior to disposal using the caustic until a neutral pH is achieved. Caustic remaining on the china pieces after the stop bath, is rinsed off with fresh water and overflows to the etch room floor where it runs to the central neutralization sump, mixes with any acid drips and is further neutralized by

flowing through a bed of dolomitic marble chips. The marble chips are removed from time to time, the fines are separated and these marble chips and any necessary makeup are returned to the neutralization pit. The effluent from the neutralization pit flows into an ejector sump and then discharged through an ion exchange column followed by a granular activated carbon column before being discharged to the Industrial Waste System.

Etch tank sludges are neutralized before disposal and neutralization pit marble chip fines are washed and decanted before testing for pH prior to disposal. These operations are performed at most twice a year and produce small volumes of wastes.

The resist removed from etched ware is periodically distilled in place, in the vapor degreaser, to remove as much TCE as possible. The TCE is condensed and stored in an internal solvent reservoir for reuse. The hot asphalt and wax sludge is drained through a heated line to a tightly connected drum for collection and disposal. Vapors from the drum are displaced back into the vapor degreaser. When the collection drum has cooled, solidifying the sludge, the drum is disconnected from the line, labeled as hazardous waste and removed to the Hazardous Waste Storage Pad.

Trichloroethylene is the selected vapor degreaser solvent as its boiling temperature is hot enough to melt the wax and it has adequate solvency to remove the asphaltic resist. Other solvents boil at temperatures which are either too hot, and present a danger of scalding the operator, or too cold, to thoroughly melt the wax, and others were rejected for having yet worse health and environmental problems.

The best way to minimize hazardous waste in this process is to replace the entire etch process.

Costs assigned to this operation include the TSD facility costs incurred for disposing of TCE sludge and replacing spent granular activated carbon columns. The cost to dispose of 7,500 pounds of hazardous waste TCE sludge in 1992 was about $15,000.

1.2.3.4 Gold Lining - This operation is split between three operations: Hand Lining, Machine Lining and Backstamping. All of them are involved in the application of precious metals such as gold or platinum and minor amounts of other precious metals used as alloying elements such as rhodium or rubidium. Only

the methods of application are different and result in somewhat different recycle streams. The precious metals are applied as paints and require the use of solvents to thin or remove them when misapplied and reclaim them from the equipment when finishing a run or switching the precious metal being applied. Therefore there are no wastes generated in these operations. Rags, paper and solvents only become wastes in the process of reclaiming the precious metal at an outside facility. These materials are not wastes and are not handled as hazardous wastes when they are produced in accordance with the approved procedures for Gold Lining. Before this step is accomplished, those materials are the necessary carriers of the reclaimed precious metals.

Precious metal paints are obviously expensive, but a significant portion of those costs are related to the cost of dispersing the precious metal in a paint. Furthermore, precious metal reclaim costs partially offset the value received for the precious metals reclaimed. These operations will be evaluated for process changes which will minimize the amount of precious metal paint sent out to reclaim.

Some of the solvents, if generated as wastes, would be hazardous wastes. These processes will be evaluated to determine if less hazardous solvents can be substituted or their use minimized. A particular target for substitution is in the final removal of paint films from application equipment at the end of a run or when switching the precious metal being applied.

Waste handling or disposal costs are generally not assigned to these operations as there are no wastes generated - only reclaim.

1.2.3.5 Color Lining - This operation is identical in all aspects to Gold Lining, above, except that precious metals reclaim is not a factor and wastes are indeed produced. The following discussion follows the Gold Lining discussion, modified to address the waste issues. This operation is split between the operations of Hand Lining and Machine Lining. Both of them are involved in the application of colors. Only the methods of application are different and result in somewhat different waste streams. The colors are finely ground glasses which are applied as paints and require the use of solvents to thin them or remove them when misapplied and clean the equipment when finishing a run or switching the color being applied. Color paints, paper and rags are the wastes generated in this operation. These materials are not wastes and are not handled as hazardous wastes when they are produced in accordance with the approved procedures for Color Lining.

Color paints are somewhat expensive due primarily to the cost of dispersing the color in a paint. These operations will be evaluated for process changes which will minimize the amount of color paint lost as wastes.

Some of the solvents, if they are listed by the Environmental Protection Agency, would be hazardous wastes. These processes will be evaluated to determine if less hazardous solvents can be substituted or if their use can be minimized. A particular target for substitution is in the final removal of paint films from application equipment at the end of a run or when switching the color being applied.

Waste handling or disposal costs can be assigned to these operations as a proportion of TSD facility costs.

1.2.3.6 Gold Silk Screening - The precious metals paints are silk screened onto release paper and covered with a transparent transfer film and require the use of solvents to thin them or remove them when misapplied and reclaim them from the equipment when finishing a run or switching the precious metal being silk screened. Therefore there are no wastes generated in this operation. Rags, paper and solvents only become wastes in the process of reclaiming the precious metal at an outside facility. These materials are not wastes and are not handled as hazardous wastes when they are produced in accordance with the approved procedures for Color Silk Screening. Before this step is accomplished those materials are the necessary carriers of the reclaimed precious metals.

Precious metal paints are obviously expensive, but a significant portion of those costs are related to the cost of dispersing the precious metal in a paint. Furthermore, precious metal reclaim costs partially offset the value received for the precious metals reclaimed. These operations will be evaluated for process changes which will minimize the amount of precious metal paint sent out to reclaim.

Some of the solvents, if generated as wastes, would be hazardous wastes. These processes will be evaluated to determine if less hazardous solvents can be substituted or if their use can be minimized. A particular target for substitution is in the final removal of paint films from application equipment at the end of a run or when switching the precious metal being silk screened.

Waste handling or disposal costs are generally not assigned to this operation as there are no wastes generated - only reclaim.

1.2.3.7 Color Silk Screening - The color paints are silk screened onto release paper and covered with a transparent transfer film and require the use of solvents to thin them or remove them when misapplied and clean them from the equipment when finishing a run or switching the color being silk screened. Rags, paper and solvents only become wastes in the process of reclaiming the precious metal at an outside facility. Rags, paper and solvents are the wastes generated in this operation. These materials are not wastes and are not handled as hazardous wastes when they are produced in accordance with the approved procedures for Color Silk Screening.

Color paints are somewhat expensive due primarily to those costs related to the cost of dispersing the color in a paint. These operations will be evaluated for process changes which will minimize the amount of color paint lost as wastes.

Some of the solvents, if they are listed by the Environmental Protection Agency, would be hazardous wastes. These processes will be evaluated to determine if less hazardous solvents can be substituted or if their use can be minimized. A particular target for substitution is in the final removal of paint films from application equipment at the end of a run or when switching the color being silk screened.

Waste handling or disposal costs can be assigned to these operations as a proportion of TSD facility costs.

1.3 Support Operations - These operations support the manufacturing operations of the Division and either have a direct impact on the amount of wastes generated in manufacturing operations or themselves contribute to the generation or control of wastes. Their operations are described below.

1.3.1 Environmental Operations - This department was created to be responsible for all environmental activities at the facility and oversee required compliance by the other departments. Its responsibilities include operating the Industrial Waste Treatment Plant, operating the on-site TCE Remediation System, preparing and maintaining all environmental procedures, performing all monitoring activities required by permits issued to the facility, supervising the collection and disposal of hazardous and non-hazardous wastes generated at the facility, spill response and reporting and assuring that waste minimization is an ongoing activity in all operations.

1.3.1.1 Waste Water Treatment - The Industrial Waste Treatment System consists of two major components and is operated under the requirements of the NJPDES-DSW Permit. The Industrial Waste Treatment Plant receives and treats all non-hazardous industrial waste water streams. The Glaze Waste Treatment System receives and treats all lead containing industrial waste water streams. The treated Glaze Waste effluent may be discharged to either the Industrial Waste Treatment System or the ACUA sewage system.

The major loading on this system consists of inorganic particulate matter, primarily clays, other feldspathic minerals and plaster. A minor portion of the load is non-hazardous organic binders. Water is received in a large surge tank where it is thoroughly mixed and blended with flocculating agents. It is then pumped, at a constant rate, to the rapid mix and floc tanks for final polymer additions just prior to entering the clarifier. Sludge is drawn from the bottom of the clarifier and dewatered in a vacuum filter. Dewatered sludge is placed in trucks or roll-off containers for disposal after tests confirm that it is non-hazardous. Vacuum filter filtrate is returned to the clarifier. Clarifier effluent is discharged directly to a surface water stream.

1.3.1.2 Glaze Waste Treatment - The Glaze Waste Treatment System receives and treats all lead-containing industrial waste water streams. These waters are collected in a surge tank(s) prior to the addition of treatment chemicals to inactivate a minor portion of non-hazardous organic suspension agents and precipitate suspended and dissolved lead particulate for clarification. The water is metered to a small clarifier and the glaze sludge is drawn from the bottom of the clarifier and filter pressed. The filtrate is sent back to the clarifier. The clarifier effluent is passed through an ultrafiltration unit to remove all particulate and then through a bed of activated clay to remove any dissolved lead. Backwash from the ultrafiltration unit is directed back to the clarifier. The treated water is held temporarily in a tank for sampling prior to dosing to the POTW serving the facility.

1.3.1.3 Hazardous Waste Storage - Except for the glaze sludge, all hazardous materials are collected and stored on the Hazardous Waste Storage Pad. All hazardous wastes are shipped to permitted TSD facilities before the ninety day storage limit. Hazardous materials are either collected at satellite locations in the facility or sent directly to the pad upon generation. They are properly identified and labeled prior to being placed on the pad and recorded in the hazardous waste inventory. Glaze sludge, waste glaze and other lead

contaminated waste particulate is collected and stored in a covered, sealed gate, roll-off box for shipment to a permitted TSD facility for delisting.

Environmental Operations has restricted access to the pad and is thus aware of the source of all wastes sent to the pad. It is the duty of the Environmental Operations Manager to determine that generation of all hazardous wastes is in accordance with the Waste Minimization Plan.

1.3.1.4 General Recycling - Environmental Operations is responsible for overseeing the proper operation of the facility's trash collection and recycling operations which are primarily performed by the Plant Maintenance Department. Wastes are segregated, as they are generated, into various dedicated receptacles placed appropriately throughout the facility. Maintenance collects and empties these containers into larger dedicated receptacles for shipment to either the Municipal Utilities Authority Transfer Station for recycling and disposal or directly to a recycler. Environmental Operations is responsible for determining how these wastes are being generated, that they are being minimized in accordance with the Waste Minimization Plan and that they are being appropriately recycled or sent to landfill.

1.3.2 Quality Assurance - The Lenox Manufacturing Division has made a commitment to Total Quality Manufacturing under its Total Quality Lenox (TQL) program. TQL addresses every aspect of manufacturing Lenox products including waste minimization. A primary goal of TQL is to provide the control of raw materials and manufacturing processes required to manufacture products of the highest quality while producing zero defects. Waste minimization is inherent in this process.

The Quality Assurance Department includes Laboratory Control which generates some process wastes of is own in the sampling and testing of raw materials, batches and samples of china pieces in various stages of manufacture. In addition they perform pilot production runs to test new formulations and manufacturing processes. In many cases, the resultant batches and pieces must be discarded as wastes. The expense in labor and materials to run these trials is a strong incentive to minimize the quantity of wastes produced by carefully considering this factor in the design and implementation of trial runs. In particular, it is expected that the quantity of non-standard raw materials purchased or accepted as no cost samples, be kept to a minimum and that the cost of disposal of excess materials be carefully considered when determining what quantity to order versus economic purchase quantities or the convenience of having a larger quantity of the material on hand.

Glaze wastes are routinely generated in the control of glaze batches and will be hazardous wastes if the glaze formulation contains lead. Segregated waste disposal sinks connected to the Glaze Waste Treatment System have been provided for lead glaze wastes. The preparation of enamel colors by Laboratory Control produces some lead characteristic hazardous wastes which are disposed of to a permitted TSD facility.

There are presently no separate data available on the costs to dispose of wastes from this operation. These costs would be included in the costs assigned to the related process.

1.3.3 Research and Development - Research and Development (R&D) is currently located in a remote facility off of the manufacturing facility property. R&D conducts trial and pilot operations in the facility. During the course of these operations a wide variety of materials are routinely handled, both in the investigation of problems with current formulations and processes and the investigation of new formulations and processes.

The wide variety of wastes generated are usually disposed of as "Lab Packs" to a permitted TSD facility. This is a considerably more expensive way to dispose of hazardous wastes as opposed to the more economical disposal of bulk materials on a cost per pound basis. Lab Pack costs generally reflect the number of different materials and containers rather than the actual pounds of material. In addition, if the wastes are inadequately identified, they must be tested to determine their characteristics for appropriate consolidation and disposal. There are no cost savings if the waste was non-hazardous to begin with - it is too expensive to determine that the waste is, in fact, non-hazardous.

R&D personnel must be careful to assure that materials to be tested are identified and referenced to their MSDS's in some permanent manner when received and be careful to maintain traceability from receipt to disposal. Each individual investigator should carefully consider how a material will eventually have to be disposed of when deciding how much of that material to bring into the facility. In particular, it is expected that the quantity of materials purchased, or accepted as no cost samples, will be kept to a minimum and that the cost of disposal of excess materials will be carefully considered when determining what quantity to order versus economical quantities or the convenience of having a larger quantity of the material on hand.

1.3.4 Maintenance - Although the scope of maintenance operations is extensive, wastes are generally confined to waste lubricating oils, cleaning solvents, paints recyclable

scrap and trash. Waste lubricating oils are generated in the maintenance of all types of plant equipment including forklifts and small engines. These waste oils are collected and sent out for recycling. Parts cleaning is accomplished using a Safety-Clean parts cleaning station which is routinely serviced by Safety-Clean. Most painting is handled through outside contractors with only limited requirements for repainting equipment and touching-up walls and furniture. The limited amounts of paints and solvents are managed, when necessary, along with lab packs and bulk solvent shipments to permitted TSD facilities.

Any wastes generated in maintaining process equipment are confined to the operation being serviced and are handled as part of that operations waste stream. Maintenance and modification of the facility and associated equipment generates various unique, non-routine wastes such as asbestos containing demolition debris. Maintenance personnel have been trained and certified in asbestos encapsulation, removal and handling for small quantities of asbestos associated with equipment repairs. Large jobs are handled by advising Environmental Operations of the requirement and retaining an asbestos remediation contractor. Other wastes are handled on a case by case basis. Boiler treatment chemicals are seldom disposed of as they are managed so as to be totally consumed in water treatment. Boiler blowdown volumes are relatively small and are discharged to the sewage system.

The parts cleaning station should be evaluated to determine if a less toxic solvent or aqueous cleaner can be substituted. It is very likely that Safety-Clean is the best method of handling parts washing as used oil is a hazardous waste in New Jersey. Paint and solvent wastes can be minimized by using latex based paints whenever possible.

The only hazardous waste costs assigned to Maintenance are those associated with parts cleaning using Safety-Clean's services for 2,300 gallons at a cost of about $3,000 annually.

1.3.5 Facility Engineering - Most of the repair and modification work related to Facilities Engineering is handled by contractors. Their contracts specify the requirements for handling any wastes generated by these activities. Work not handled by contractors is handled by Maintenance.

No costs are separately assigned to Facility Engineering.

2 Corporate Environmental Policy - a copy of Jerome Ciszewski's Environmental/Compliance Policy memo dated December 3, 1992 is included as a part of this plan.

2.1 Hazardous Waste Minimization Policy - this is clearly spelled out in section 1, Planning of the policy memo and is implemented by this Waste Minimization Plan.

2.2 TQL Policy - The Waste Minimization Plan is implemented under the TQL Policy.

LENOX

LENOX, INCORPORATED
INTER OFFICE CORRESPONDENCE

TO: Distribution

DATE: December 3, 1992

SUBJECT: Environmental/Compliance

FROM: Jerome J. Ciszewski

COPIES SENT TO:
L.A. Fantin
R.O. Cohen
N.C. Kuehnast
S.F. Lichtenstein

As you know, the Company continues to address major environmental issues at our facilities. We have learned that the resolution of environmental issues is very expensive both from the standpoint of direct costs for outside consultants and the indirect costs of diverting executive time. It is my objective to maintain Lenox's environmental maintenance program to eliminate this costly process. This memorandum is to confirm, as modified, R.L. McGee's memorandum of February 1, 1989, a copy of which is attached.

The continued implementation of this program requires the continuation of effective channels of communication. At the corporate level, I want to be involved personally with manufacturing activities which may affect the environment. I also will involve Steve Lichtenstein and Lou Fantin of the Legal Department with all environmental issues. Bob Cohen of the Legal Department also is available to help. At the plant level, Neil Kuehnast and his Environmental Engineers will assist you with all environmental matters.

There are four specific areas which need to be addressed:

1. Planning: An effective way to avoid environmental problems is to minimize the production of industrial waste. Accordingly, it is very important that you review continually your operations with a view toward minimizing the production of industrial waste, both hazardous and non-hazardous. Aside from the benefit to Lenox of industrial waste minimization, federal and state legislation will be imposing such efforts on manufacturing facilities. I want you to communicate on at least a quarterly basis with Neil Kuehnast on your efforts to minimize the amount of industrial waste generated from your manufacturing process. You also need to pursue opportunities to recycle generated waste. We will be able to reduce disposal costs significantly if waste is recycled through proper channels. Before committing the Company to any recycling arrangement, you must consult with the Legal Department. Moreover, if you are planning to make any changes or additions to your manufacturing process, Neil must be involved to assist you with making these changes or additions in the most cost effective and environmentally sound manner.

2. Compliance: Federal, state and local environmental laws and regulations have extensive reporting and permitting requirements. You must assign a high level person at your plant to take responsibility for complying with these requirements. The assigned person should be given ample time to prepare and submit reports and permit applications in an appropriate manner.

This is an important function because the Company is subject to substantial fines and possibly criminal penalties if environmental reports and/or permit applications are inaccurate or not submitted in a timely manner. Neil Kuehnast and his staff will provide technical

expertise to assist you with all these requirements. In addition, Lou Fantin will advise you on the legal requirements of each report. All drafts of environmental reports and/or permit applications must be submitted to Neil Kuehnast and his staff and Lou Fantin for their review. Do not wait until the last minute to prepare them!

3. Environmental Problems: I want you to be aggressive in identifying environmental problems at your facility. The most cost effective way of dealing with an environmental problem is to identify and correct it at its early stages. When you spot a problem or potential problem, you must report it by phone immediately to Neil Kuehnast and Steve Lichtenstein or Lou Fantin.

4. Government Communications: From time to time, you may receive governmental communications regarding environmental or OSHA compliance. These communications may come in the form of a survey request, an inspection request, or a non-compliance letter. These types of communications must be faxed immediately to Steve Lichtenstein or Lou Fantin who will advise you on the proper response.

Conclusion:

It is important to give priority to environmental matters. We can save the Company enormous amounts of money by proper planning and early detection and resolution of operations issues having environmental implications.

Distribution:
R.M. Hopkins
S.O. Hulsey
J.T. Jones
C.B. Myers
N. Nahorniak
R.E. Ruark
J.J. Vresics

3 Education and Training - This document will be used as a training base for all personnel involved in OSHA Right to Know training, Emergency Response training, Supervisory training, process training, and TQL training.

3.1 Training Manuals - Waste Minimization Manuals prepared by the Environmental Protection Agency and the New York State Department of Environmental Conservation are listed here and were used in developing this plan. The highlighted manuals and their forms are available through Environmental Engineering and will be used to conduct training related to Waste Minimization.

3.2 Training Module - Environmental Engineering and Environmental Operations will prepare and present a training module for Waste Minimization to TQL committees or engineering groups in preparation for evaluating existing processes. This module or a less detailed version will be packaged for use by Human Relations for supervisors and process operator training.

In preparing a Hazardous Waste Reduction Plan (HWRP), the references below should be consulted.

RESOURCES

Conducting Waste Minimization Assessments

1. Waste Minimization Opportunity Assessment Manual, EPA/625/7-88/003, July 1988. Available through: U.S. EPA, Office of Research and Development, Cincinnati, Ohio 45268, tel. (513) 569-7562 or NTIS, 5285 Port Royal Road, Springfield, VA 22161, tel. (703) 487-4600.

2. Region II Hazardous Waste Reduction Plan Requirements Checklist. Available through U.S. EPA-Region II, Hazardous Waste Facilities Branch, Andrew Bellina, tel (212) 264-0505.

3. New York State Waste Reduction Guidance Manual, March 1989. New York State Waste Reduction Guidance Manual Supplement, December 1989. Available through the New York State Department of Environmental Conservation, Bureau of Pollution Prevention, 50 Wolf Road, Albany, New York 12233-7253, tel. (518) 485-8400. (This guidance is also recommended for Permittees located in Puerto Rico or New Jersey.)

4. 1989 Waste Minimization Report Instructions and Forms. Available through U.S. EPA-Region II.

Waste Minimization Technologies and Case Studies

1. Pollution Prevention Information Exchange System (PIES), a service which is part of U.S. EPA's Pollution Prevention Information Clearinghouse (PPIC). Contact PPIC Technical Support Office at (703) 821-4800.

2. Pollution Prevention News, to be added on mailing list contact: Pollution Prevention News, U.S. EPA, 401 M Street SW (PM-219), Washington DC 20460.

3. Specific industry journal, waste management journals, or general engineering journal (e.g., Chemical Engineering, Pollution Engineering).

4. Pollution Prevention Resources and Training Opportunities in 1992. EPA/560/8-92-002, January 1992. Available through: U.S. EPA, Office of Pollution Prevention and Toxics (tel. 202-260-3557) and the Office of Environmental Engineering and Technology Demonstration (tel. 202-260-2600).

5. USER'S GUIDE: Strategic WAste Minimization Initiative (SWAMI) Version 2.0. EPA/625/11-91/004, January 1992. Available through: U.S. EPA, Office of Research and Development, Cincinnati, OH 45268. tel. (513) 569-7562.

6. Achievements in Source Reduction and Recycling for Ten Industries in the United States. EPA/600/2-91/051, September 1991. Available through: U.S. EPA, Office of Research and Development, Cincinnati, OH 45268. tel. (513) 569-7562.

4 Hazardous Waste Generating Processes and Operations

4.1 Acute Hazardous Wastes - No acute hazardous wastes are presently manufactured or otherwise used in this facility for production purposes. They may be used on-site from time to time by contractors certified for landscape maintenance or in other unforeseen applications. Anyone responsible for contracting such work will contact Environmental Operations to initiate appropriate protection for Lenox and its personnel and to assure that appropriate legal issues are addressed in the contract. Environmental Operations will discuss the appropriate issues with Lenox's Legal Department.

In the event that a new product or process requires the use of an acute hazardous material, Environmental Operations will be notified well in advance and will assure that the Waste Minimization Plan evaluation steps have been thoroughly applied to the process and review this plan for amendment of this and other appropriate sections.

4.2 Previous and On-going Waste Minimization Programs - Lenox has always sought to run an efficient manufacturing plant and to minimize the production of wastes. This is particularly true in regard to glaze materials and TCE sludge.

4.2.1 Used Slip Materials - The Lenox manufacturing process which was originally brought to the Pomona facility included the incorporation of used or off-specification slip materials for the preparation of new batches. All of the clean (not contaminated with other formulations, process materials, such as plaster, or dirt) used slip, forming scrap and broken greenware produced prior to bisk firing are collected and reprocessed as required and the proportion of scrap to virgin is a closely followed production variable.

Industrial waste waters consist of diluted slip materials from process equipment washdown required to prevent cross-contamination from other formulations or the inclusion of process dirt. These waste waters are collected in an industrial waste system. From the start of operations at Pomona, industrial waste waters were settled out in the Slip Basin before the discharge of clarified effluent. In the late 1960's an Industrial Waste Treatment Plant was installed to provide for improved clarification of waste waters and disposal of the sludge on a day to day basis as opposed to collection in the Slip Basin for future disposal. This china clay sludge is a recyclable material and while it could be used to make china products, it is totally unsuitable for the manufacture of fine china. Also, the material in the Slip Basin had become contaminated with waste glaze material and eventually had to be

stabilized and entombed in place, in accordance with a state approve RCRA closure plan.

The capacity of the Industrial Waste Treatment Plant was strained from the start-up and a series of upgrades were made to increase capacity and effluent quality. By the late 1970's a "Zero Discharge" policy was in effect and process changes were made to reduce the volumes of slip waste being generated. In the batch house, slip batch equipment washdown water was captured and stored in stirred tanks for use in making up new batches. The number of new batches produced was reduced. At the same time all glaze washdown waters were segregated from the industrial waste stream and a process was developed to separately treat and settle glaze wastes.

Coupled with improvements in the chemicals used to clarify the waste waters and extensive efforts to reduce the volume of waste waters generated, the current level of operation consistently produces effluent quality which exceeds permit requirements and approaches state of the art for the equipment and processes. In addition the volume of slip wastes generated and the load on the Industrial Waste Treatment plant have been greatly reduced.

Segregation of glaze and slip wastes permitted the Industrial Waste Treatment Plant sludge to be routinely offered for recycling outside of the plant as opposed to disposal in lined landfills. At this time the sludge is being supplied as a raw material for the production of white portland cement. Other opportunities continue to be pursued.

4.2.2 Used Glaze Materials - From the start of operations at Pomona, glaze-laden waters were settled out in a used-Glaze Basin behind the plant with the intention of developing a method for recycling used-glaze in the process. With the development of the automatic glaze spray process, increasing amounts of used-glaze were being settled in the basin.

To improve the yield of glazed pieces from the automatic spraying process, various process and equipment modifications were developed. Baffles were installed in the back of the glaze spray booths and washed with recirculated booth washdown and scrubber water to rebuild it to spray weight. Spindle wash continued to be sent to the Glaze Basin.

By the early 1970's, use of the Glaze Basin had been abandoned and spindle wash was rerouted to the new Industrial Waste Treatment Plant. At the same time, the procedures had been developed for recycling used-glaze from the Glaze Basin. This

process was being used in production when a severe glaze and body contamination problem hit the plant and the process was temporarily abandoned until the source of the contamination was determined. The source was tracked down and corrected and glaze recycling reinstituted. However, it was eventually realized that silicon carbide contamination of the china clay raw material was not an isolated incident. Silicon carbide use was found to be so wide-spread that vehicles entering the property had added significant amounts of silicon carbide to the contents of the Glaze Basin. Procedures were developed to remove silicon carbide from the used-glaze materials in the Glaze Basin and implemented in production. Eventually it became apparent that the risk of silicon carbide contamination of the process was too great to allow continued recycling of Glaze Basin material and the practice was terminated.

Eventually the used-glaze material in the Glaze Basin was found to be a very beneficial raw material for improving the quality of lead from secondary lead smelters involved in recycling automotive batteries. The entire remaining contents of the Glaze Basin were recycled in this manner.

By the late 1970's a "Zero Discharge" policy was in effect and spindle wash was being settled with acetic acid and clarified to reclaim the used-glaze material for blending into new batches and recirculate the water for spindle wash. In the batch house, glaze batch equipment washdown water was captured and stored in stirred tanks for use in making up new batches. The number of new batches produced was significantly reduced. At the same time, all glaze waste waters were segregated from other industrial wastes. A state-of-the-art process was developed to separately treat and settle them in a clarifier prior to ultrafiltration of the effluent water which is now discharge to the Atlantic County Sewage Authority with virtually no lead content. Discharge to sewage was necessitated by the sugar content of the glaze materials. The concentrated glaze sludge is characteristically hazardous for lead and was previously sent to a secondary smelter. As of this time, it is more economical to send the sludge to Envirite where it is used in a process to delist hazardous plating wastes.

Eventually procedures were developed to routinely capture all used glaze with the exception of floor drippings and spills which are considered to be too contaminated for reuse. This latest round of process improvements has resulted in reduced losses of glaze materials and a greater than fifty percent reduction in the volume of hazardous sludge for disposal over the last five years.

4.2.3 TCE Solvent - In 1964 the current trichloroethylene (TCE) vapor degreaser process was developed to strip resist materials from pieces after etching. From the start of this process operation, TCE had been manually transferred from 55 gallon drums to the degreaser in 5 gallon pails. The sludge was drained off weekly through a pipe into open top 55 gallon drums setting outside of the building.

In the late seventies a replacement degreaser was purchased and several upgrades were made to the process. Fresh TCE was transferred to the degreaser by gravity flow through quick disconnect piping and subsequently using a special drum pump. The sludge removal process was changed to require distilling TCE from the sludge before removing the now thickened sludge through a heated pipe to a tightly connected drum. Air and TCE vapors from the drum were vented back to the degreaser through a tightly connected vent line. These improvements greatly reduced the risk of a spill, reduced the amount of TCE being released to the atmosphere and reduced the volume of sludge for disposal. An overall improvement in the process was also obtained.

4.2.4 Aqua Regia - In 1990 Lenox eliminated its process for reclaiming precious metals fired on to fine china pieces as unjustified compared to the value of the metal reclaimed and the risks incurred by handling the concentrated acids. However, no hazardous wastes were generated by this process.

4.2.5 General Trash Recycle - When the Pinelands Commission closed all landfill operations in the Pinelands protection area in 1990, Atlantic County required that all non-hazardous waste streams to be sent to the County Transfer Station for shipment to Pennsylvania for landfill. Recyclable material waste streams had to be segregated and either sent to the Transfer Station or sent directly to a recycler. Environmental Operations and Maintenance cooperated to identify recyclable waste streams, provide equipment and labor to segregate and collect them and initiate the policies and training required to implement recycling throughout the plant and offices. Lenox was the first recipient of a County award recognizing outstanding commitment to and achievement of recycling. This effort has grown and become more efficient with the result that Lenox produces a volume of recycle as large as all of Galloway Township's entire recycle volume. The volume of recycle and cost savings are tracked in a monthly report. The ongoing effort is now directed at minimizing waste generation and thereby the volume of recycle while further increasing the percent of wastes being recycled.

4.3 Hazardous Waste Generation and Handling - This section identifies at least 90% of all the non-acute hazardous wastes generated at the facility, describes the source of generation and management of each waste stream and discusses opportunities to minimize the waste prior to generation or to beneficially recycle it if an opportunity has been identified. Note that a total of 9,000 pounds of hazardous wastes were sent to TSD facilities at a cost of $81,000. These costs have not been not separately allocated to the source waste streams.

4.3.1 Glaze Waste Treatment - Maintenance of equipment cleanliness and cleanup of minor spills, and the removal of splashes of dried glaze, generates waterborne waste streams from batching and glaze application. The waste flows from the batching and glaze application process areas are piped directly to the glaze waste treatment system. The operation of this system is covered above under Support Operations, Environmental Operations, Glaze Waste Treatment (1.3.1.2). The filter pressed sludge and spent activated clay, Berringite, is hazardous and is shipped off-site for treatment at a TSD facility where it is delisted.

Sending the wastes to a secondary smelter is an option for external recycling as opposed to delisting through a TSD facility.

4.3.2 Glaze Dust Collection - Several steps in the manufacturing process generate lead glaze dust from bag houses. These baghouses are dedicated to process steps which produce only lead glaze containing dusts, thus segregating the glaze-containing dusts from other process dusts. The only exception is the batch weigh scale dust collector. The dust, the filter cartridges or bags and HEPA filters are hazardous wastes.

Contamination of dust from the batch weigh scale dust collector with leaded glaze frit and zinc oxide dust could be eliminated by installing a separate weigh scale and bag slitter for weighing lead glaze batches and connecting it to the glaze mill area dust collector. This would also isolate the relatively large zinc fraction and minor barium fraction in the Chinastone glaze. The volume of leaded glaze batches is less than two percent of the total weight of batches and would not be likely to pay for itself and there is currently no benefit by isolating zinc and barium. The mass of the filter cartridges is minimized by removing metal parts and the volume is minimized by compacting the filters into metal drums for disposal. Approximately 2,000 pounds are disposed of annually.

Sending the wastes to a secondary smelter is an option for external recycling as opposed to disposal through a TSD facility.

4.3.3 Lead Dust Collection - These dusts are added to the Glaze Waste Treatment sludge along with material cleaned out of downdraft benches, HEPA filtered vacuum cleaners, and miscellaneous cleanup wastes.

Sending the wastes to a secondary smelter is an option for external recycling as opposed to disposal through a TSD facility.

4.3.4 Acid Etch Sludge - This sludge contains the lowest feasible percentage of TCE and nothing could be gained if it were further distilled because the sludge is a specific Subpart D Waste, F001. An alternative process which does not use solvents is being developed.

4.3.5 Waste Lubricating Oils - Maintenance collects spent lubricating oils from the routine maintenance of machinery and equipment. This material is transferred from the drain pan or other receiver into hazardous waste oil collection tanks located in the general storage area of the storage pad. Waste oil is hazardous in New Jersey. This hazardous waste oil is stored and transported to a permitted recycler on a hazardous waste manifest. Approximately 7,500 gallons was recycled at a net cost estimated at $1,500

4.3.6 Parts Washing Solvent - Maintenance uses a Safety-Clean parts washer in the Maintenance Shop for degreasing machinery and equipment when it its serviced. The solvent is a hazardous waste and is periodically collected by Safety-Clean and transported to their recycling facility on a hazardous waste manifest. A less toxic solvent or aqueous based cleaner should be evaluated for this application. However, the resultant waste may still be a New Jersey hazardous waste oil.

4.3.7 Machine Lining Parts Washing - Acetone is the solvent presently used for removing paint film from machine parts after the precious metal paints have been applied. The acetone is contained in a parts washing station which is only used for washing equipment used to apply precious metal paints. The acetone is supplied to the rinse nozzle on demand after being filtered to remove precious metal particles, paint film and any bits of paper, rag or brush bristles. The solvent then drains back into the reservoir under the sink. When the solvent in the wash station becomes saturated with dissolved precious metal paint film it is removed and sent to a precious metal reclaim facility. The filter cartridge is removed more often as it becomes clogged or to minimize the inventory of precious metal paint to be recycled.

Acetone, if generated as a waste, would be a hazardous waste. Due to the use of Acetone for this operation, the filter cartridge and spent solvent removed from the

cleaning station are required to be manifested to the precious metal reclaim facility as hazardous wastes, even though they are not in fact wastes until generated by the reclaim of the precious metals. This processes will be evaluated to determine if a less hazardous solvent or cleaner can be substituted.

Waste handling or disposal costs are generally not assigned to this operation as there are no wastes generated - only reclaim.

4.3.8 Hand Lining Wiping Rags - Hand Lining produces precious metal recycle streams which contain rags, paper and solvents. These materials are not wastes and are not handled as hazardous wastes when they are produced in accordance with the approved procedures for Hand Lining. Therefore they are not required to be handled, stored or shipped to the precious metal reclaim facility as hazardous waste.

Hand Lining also produces color waste streams which are not hazardous when produced in accordance with the approved procedures, except in the case of colors which are known to be environmentally unstable prior to fusing to china pieces and are tested and determined to be characteristic hazardous wastes and/or a limited and segregated quantity of rags and paper wastes generated in the initial preparation of the color paints. Except for these two waste streams, which are separately collected, stored and disposed of to a permitted TSD facility, color wastes are not hazardous wastes.

4.3.9 Silk Screen Wastes - Silk Screen produces precious metal recycle streams which contain rags, paper and solvents. These materials are not wastes and are not handled as hazardous wastes when they are produced in accordance with the approved procedures for Silk Screen. Therefore, they are not required to be handled, stored or shipped to the precious metal reclaim facility as hazardous waste.

Silk Screen also produces color waste streams which are not hazardous when produced in accordance with the approved procedures, except in the case of colors which are known to be environmentally unstable prior to fusing to china pieces and are tested and determined to be characteristic hazardous wastes and/or a limited and segregated quantity of rags and paper wastes generated in the initial preparation of the color paints. Except for these two waste streams which are separately collected, stored and disposed of to a permitted TSD facility, color wastes are not hazardous wastes.

4.3.10 Waste Decals - The destruction and disposal of decals which are known to be environmentally unstable, and which tests demonstrate are characteristic hazardous

wastes, requires that these hazardous decal wastes be disposed of at a TSD facility. These decal wastes are generally disposed of along with lead containing rags and paper and/or dust collector cartridges.

4.3.11 Spill Cleanup Wastes - One of the risks of handling a hazardous material is an accidental spill. If this occurs, the personnel who discover or are involved must immediately notify Environmental Operations to assure that the event is properly reported and that expeditious action is taken in accordance with the Lenox Spill Response Procedures. Environmental Operation will address each spill as required by the plan which sets out specific requirements for minimizing the impact of the spill and the quantity of hazardous waste generated by the cleanup. Spill cleanup wastes are sampled as necessary for proper hazardous waste characterization and containerized, labeled and placed on the hazardous waste storage pad. Unless identification and analyses procedures clearly confirm that the spill cleanup wastes are nonhazardous, wastes are disposed of to a permitted TSD facility. However, the process will not cease with proper cleanup and disposal. A Waste minimization evaluation will be made to determine what steps if any can be taken to prevent future spills or minimize the volume of hazardous waste or cleanup materials involved in a spill.

Waste Minimization Plan

Current Revision: June 28, 1993

5 Waste Minimization Plan - This Waste Minimization Plan implements the Lenox China Pomona, N.J. policy on waste minimization. It is intended to be a "working document" which will be reviewed biannually and amended as waste minimization evolves. It will be implemented to assure an organized, comprehensive and continual effort to systematically reduce waste generation.

5.1 Purpose - The purpose of this plan is to serve as a planning and training guide to implement waste minimization at all points in the product design and manufacturing cycle as an inseparable part of a total quality management program.

5.2 Applicability - This plan applies to all manufacturing activities including design, engineering, research and development, maintenance and waste handling. It applies to the design of the products, maintenance and development of formulations, processes and equipment, and to the design and operation of recycling, waste handling and treatment systems.

5.3 Process Evaluation - The major waste streams are identified in order of their priority for waste minimization on the Waste Stream Priority List. The processes generating these wastes will be evaluated in accordance with this plan.

5.3.1 The first step in a process evaluation is to become familiar with the information in the China Manufacturing Operations section of the Introduction and the Previous and On-going Waste Minimization Programs and Hazardous Waste Generating and Handling sections of Hazardous Waste Identification, Generating Processes and Handling, above.

5.3.2 Evaluators will then utilize the evaluation methods suggested in the Waste Minimization Manuals and applicable forms or parts thereof to fully evaluate each selected process and propose appropriate waste minimization programs.

5.4 Review and Amendment - This plan will be reviewed and amended biannually at a minimum and whenever necessary to incorporate significant changes in any of the described Manufacturing Operations or to add descriptions of additional operations where a significant waste minimization opportunity is found to exist. As the current Manufacturing Operations list is largely limited to operations using hazardous materials, it is intended that non-hazardous materials operations will be added at such time as hazardous wastes are no longer the major consideration.

5.4.1 This plan and all revisions will be reviewed by the Plant Manager, Environmental Operations, Manufacturing Engineering, Quality Control, Research and Development and Environmental Engineering. A draft copy of the revised plan will be prepared by the Environmental Operations Manager with all changes indicated by strikeout of the obsolete text with new text in italics. Each party will review and initial the draft revision cover sheet, if they approve, and the plan will be approved when all parties have reviewed and initialed it.

5.4.2 Upon revision, the latest revision date will be entered in the upper right corner of each page and all previous revisions of the plan will become obsolete.

5.4.3 Biannual review and revision of this plan will be completed between July and the end of September. Major revisions made in the interim will not preclude performance of the annual review as scheduled. This is to assure that the most recent SARA Form R, TRI data is available and included in the revision.

5.4.4 in accordance with the Hazardous and Solid Waste Amendments (HSWA) permit, at least annually, a Waste Minimization Report must be submitted to the Regional Administrator, EPA Region II with copies to the NJDEPE, Bureau of Publicly Funded Site Remediation, Federal Case Manager. This report requires the following certification statement:

"I hereby certify that a program is in place to reduce the volume and toxicity of hazardous waste generated to the degree which has been determined to be economically practicable and that the proposed method of treatment, storage or disposal is that practicable method currently available which minimizes the present and future threat to human health and the environment."

5.5 Plan - The following waste minimization plan will be implemented.

5.5.1 A Comprehensive Waste Minimization Plan will be prepared which identifies waste producing processes, evaluates the type and volume of wastes produced, presents the costs for handling these wastes, discusses the potential for minimizing the type or volume of wastes and ranks the waste minimization opportunities according to the Waste Minimization Priority List in 5.5 below. This plan will include a summary of past waste minimization activities and current status of on-going activities.

5.5.2 The opportunities for all of the processes will be reviewed together to determine if common opportunities are shared by a number of processes. If so, the

opportunities for the individual processes may be reranked to support the common opportunity.

{During the review of individual processes, it is required that an analysis of inputs and outputs of all process materials, products, by-products, reusable materials and wastes is included. At this time, a listing of these items and consideration of how they will be quantitized is sufficient. The New Jersey Pollution Plan will require that a material balance be completed for each process and this must be initiated now. (See the NJDEPE Checklist for a brief summary of these requirements which are considerably more detailed than the EPA's requirements.) This plan will be revised in 1994 to incorporate the New Jersey Pollution Prevention Plan (PPP) requirements.}

5.5.3 The opportunities will then be prioritized between the various processes to establish which are most feasible and will produce the greatest waste minimization. Given the resources available various opportunities will be selected for implementation. The highest waste minimization priority at this time is the minimization of hazardous waste generation and only those non-hazardous waste opportunities which are fairly easy to justify and implement will be identified and implemented at this time.

5.5.4 The training of all TQL committees will include training in this Waste Minimization Plan and major revisions thereof. TQL committees will assist in the evaluation of various processes.

5.5.5 Manufacturing Engineering, Research and Development and Manufacturing will review the detailed list of opportunities with the highest priorities and present them to the Pomona Steering Committee for further review and implementation.

5.6 Waste Minimization Priority List - Approaches to waste minimization are prioritized as follows:

5.6.1 Eliminate the hazardous material - This is the most certain way to minimize hazardous waste and is a Lenox China commitment for leaded glaze and TCE.

5.6.2 Substitute a less hazardous or environmentally less sensitive material -this often considered for solvents e.g. to eliminate a listed hazardous waste in favor of producing a characteristic hazardous waste or preferably a non-hazardous waste. This may require using a substitute with somewhat different process efficiencies

requiring longer drying times, increased cleanup time or even generating more, but less hazardous wastes.

5.6.3 Modify the process or operation to produce a less hazardous waste - Using the same or similar raw materials, it is sometimes possible to prevent the generation of a more hazardous waste even though somewhat different process efficiencies may have to be accepted or even the generation of more, but less hazardous wastes.

5.6.4 Modify the process or operation to produce less waste - if the hazardous material cannot be eliminated from the process, it is necessary to review the process parameters to assure that the least possible amount of hazardous waste is generated. For example TCE degreaser sludge is a listed hazardous waste regardless of the amount of TCE in the sludge, so the process would be carefully monitored to assure that sludge and TCE wastes are not generated in amounts greater than required to assure quality results from the process.

5.6.5 Modify the process or operation to permit or accept previously wasted material to be recycled in the process with the minimum amount of adjustment or reclaim. This is an in-house approach similar to the glazing operation in which overspray is captured and recirculated to build it back to spray weight while spindle wash and scrubber waters are returned to the glaze batch house for incorporation in fresh batches.

5.6.6 Modify the process or operation to produce a waste which can be beneficially recycled outside of the process as opposed to treatment and/or disposal. - Wastes from a process are evaluated to determine if there is any potential for supplying the wastes generated as a raw material for another process at another facility. For example Lenox has previously supplied glaze waste treatment sludge as a smelting aid for battery reclaimers.

5.7 Current Waste Minimization Opportunities List - This list contains those waste minimization opportunities which have been identified. Their status in each of the following categories will be indicated as a percentage completed: currently being evaluated for feasibility; being developed; or being implemented. The list will be updated quarterly and the current percent completion estimated for the indicated status.

5.8 Waste Minimization Plan schedule - A schedule for implementing this Waste Minimization Plan will be prepared including milestones for achieving specific goals.

Waste Minimization Plan

Current Revision: June 28, 1993

This schedule will be reviewed and updated at least annually or whenever major changes occur. Progress against these waste minimization goals will be summarized and reported, at least quarterly, to Neil Kuehnast, Engineering. Quarterly reports will be consolidated and into an annual report and submitted to the steering committee prior to July 1 of each year, covering the previous calendar year.

WASTE STREAM PRIORITY LIST

June 28, 1993

	RCRA	WASTE STREAM	TOXICITY	1992 TONS	DESCRIPTION
1.	D008	Ivory Gaze Preparation and Application (Sludge/Dust/Color)	Hazardous Characteristic	16.6	Sludge with less than 30% lead
2.	F001	Trichloroethylene Sludge	Listed Hazardous Waste	3.8	Sludge with about 20% TCE
3.	F003	Waste Solvents	Listed Hazardous Waste	2.9	Waste Rags and Paper with waste solvent and colors
4.	F001	Safety Clean Solvent	Listed Hazardous Waste	1.2	Liquid solvent to be reclaimed
5.	X726	Waste Lubricating Oil	New Jersey Hazardous Waste	18.7*	Liquid oil to be reclaimed *based on 7.8 pounds/gal
6.	Various	Spill Clean-up Wastes	Various	1.4	Solid absorbents
7.	NA	Industrial Waste Treatment Plant Sludge	Non-Hazardous	1,017	Sludge to be recycled

WASTE STREAM PRIORITY LIST

June 28, 1993

	RCRA	WASTE STREAM	TOXICITY	POUNDS	DESCRIPTION
8.	NA	Broken China and Setters	Non-Hazardous	1,164	Solid refractories and china to be recycled
9.	NA	Used Plaster Molds	Non-Hazardous	74.8	Solid plaster molds to be recycled

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CURRENT WASTE MINIMIZATION LIST

June 28, 1993

DESCRIPTION OF OPPORTUNITY	STATUS: FEASIBILITY	DEVELOPMENT	IMPLEMENT
-- PRIORITIZED OPPORTUNITIES --			
1. Eliminate TCE Degreaser Process - Special Etch	100%	90%	50%
2. Substitute Lower Hazard Solvents For Precious Metal and Color Reclaim/Cleanup	100%	50%	25%
3. Change Ivory Glaze Formulation to a Leadless Frit	100%	90%	10%
4. Recycle Polishing Basin Sludge to a Portland Cement Manufacturer	50%	0%	0%
5. Develop Leadless Decals and Colors	50%	10%	0%
6. Install Water Sub-metering for Departments Generating Industrial Waste	100%	NA	75%
-- UNRANKED OPPORTUNITIES --			
7. Assign Trash, Recycling and Hazardous Waste Codes to Each Department	50%	5%	0%
8. Reinstitute Collection, Storage and Reuse of Slip and Glaze Washdown Water	TBE	50%	0%
9. Utilize Treated TCE Plume Remediation Water for Irrigation, Cooling and Sanitary	25%	0%	0%
10. Substitute Other Chemicals For Chloro/Florocarbon Solvents and	TBE	0%	0%

CURRENT WASTE MINIMIZATION LIST

June 28, 1993

DESCRIPTION OF OPPORTUNITY	STATUS	FEASI-BILITY	DEVELOP-MENT	IMPLEMENT
Refrigerants				
11. Reclaim Used-glaze From Glaze Foot Scraping		TBE	0%	0%
12. Develop Foot Precoat for Glaze Dipping and Flushing		TBE	0%	0%
13. Recycle Broken China and Setters Locally as Concrete or Asphalt Aggregate		100%	50%	0%
14. Recycle Broken Setters to Refractory Manufacturer		50%	0%	0%
15. Recycle Industrial Waste Treatment Sludge Locally as Compost Addition		TBE	0%	0%
16. Recycle Clay and Glaze Sludges as Tile or Garden Ornaments		TBE	25%	0%
17. Recycle Lead Glaze Sludge to a Secondary Smelter		100%	75%	0%
18. Install a Separate Batch Weigh Scale for Glaze Materials		TBE	0%	0%
19. Substitute a Non-Hazardous Solvent or Water Based Parts Cleaning Material in Maintenance		TBE	0%	0%

WASTE MINIMIZATION PLAN SCHEDULE

June 28, 1993

DESCRIPTION OF OPPORTUNITY	RESPONSIBILITY	GOAL DATE	COMMENT
-- PRIORITIZED OPPORTUNITIES --			
1. Eliminate TCE Degreaser Process - Special Etch	R&D/PROD		
Develop 90% of patterns	R&D	Jun '93	Completed
Decomission Acid Etch	Env. Opns./Mfg.Eng.	Jun '93	
Install Special Etch Equipment in Plant	R&D/Mfg. Eng.	Jul '93	
Develop Balance of Patterns	R&D	Dec '93	
2. Substitute Lower Hazard Solvents For Precious Metal and Color Reclaim/Cleaner			
Develop Substitute Parts Cleaner for Machine Lining	Env.Opns./Prod	Mar '93	Completed
Develop Substitute Cleaners for Hand Lining, Silk Screen and Color	Env.Opns./Prod	Dec '93	
3. SUBMITTED AS BUSINESS CONFIDENTIAL.			
4. Recycle Polishing Basin Sludge to a Portland Cement Manufacturer			
Develop recycling source and obtain NJDEPE and EPA approval	Env.Eng.	Jul '94	

WASTE MINIMIZATION PLAN SCHEDULE

June 28, 1993

5. SUBMITTED AS BUSINESS CONFIDENTIAL.

6. Install Water Sub-metering for Departments Generating Industrial Waste			
Install Sub-metering in 70% of Departments	Env.Opns./Maint.	Jul '93	90% Complete
Install Sub-metering in balance of Departments	Env.Opns./Maint.	Dec '93	
-- UNRANKED OPPORTUNITIES --			
7. Assign Trash, Recycling and Hazardous Waste Codes to Each Department			
Feasibility study completed	Env.Opns./Acctg.	Nov '93	
Manufacturing Departments budget for FY '95	Prod./Acctg	Dec '93	
Start charging waste costs to Departments	Acctg./Env.OPns.	May '94	
8. Reinstitute Collection, Storage and Reuse of Slip and Glaze Washdown Water			
Feasibility study completed	Prod.	Jan '93	
9. Utilize Treated TCE Plume Remediation Water for Irrigation, Cooling and Sanitary			
Feasibility study completed	Fac.Eng.	Jul '93	
10. Substitute Other Chemicals For Chloro/Florocarbon Solvents and Refrigerants			
Feasibility study completed	Env.Opns./Fac.Eng.	Nov '93	

WASTE MINIMIZATION PLAN SCHEDULE

June 28, 1993

11. Reclaim Used-glaze From Glaze Foot Scraping Feasibility study completed	Mfg.Eng.	Jul '94	
12. Develop Foot Precoat for Glaze Dipping and Flushing Feasibility study completed	R&D	Jul '94	
13. Recycle Broken China and Setters Locally as Concrete or Asphalt Aggregate Review status annually	Env.Opns.	Jul	Better opportunity w/o lead glaze
14. Recycle Broken Setters to Refractory Manufacturer Feasibility study completed	Env.Opns.	Jul '94	Better opportunity w/o lead glaze
15. Recycle Industrial Waste Treatment Sludge Locally as Compost Addition Feasibility study completed	Env.Opns.	Jul '94	Better opportunity w/o lead glaze
16. Recycle Clay and Glaze Sludges as Tile or Garden Ornaments Feasibility study completed	Mfg.Eng./Str.Com.	Dec '94	
17. Recycle Lead Glaze Sludge to a Secondary Smelter Review status annually	Env.Opns.	Jul	Smelters lined up/cost dependent
18. Install a Separate Batch Weigh Scale for Glaze Materials Feasibility study completed	Mfg.Eng.	Jul '94	Not required w/leadless glaze

WASTE MINIMIZATION PLAN SCHEDULE

June 28, 1993

19. Substitute a Non-Hazardous Solvent or Water Based Parts Cleaning Material in Maintenance Feasibility study completed	Maint.	Dec '93 N.J. Hazardous Waste Oil Classification may eliminate benefit

6 Waste Minimization Measurements and Benefits

6.1 Implementation Schedule - This implementation schedule presents the major goals to be achieved for implementing the Waste Minimization Plan. It will be used to measure and evaluate progress in implementing the plan.

6.2 Waste Reduction Measurement Methods - Hazardous waste generation is summarized and reported to the NJDEPE and EPA annually in the SARA Form R, TRI Report due July 1 of each year for the previous calendar year. Waste reduction is tracked by comparing the pounds of ware throughput of each process with the pounds of waste generated by the process. This same ratio will be used to evaluate and report waste minimization. Each TRI material waste stream is thoroughly analyzed annually to track process inputs and determine all of the associated outputs and their fates. This information is available to investigators and reviewers.

6.2.1 The total pounds of each hazardous waste generated are summarized annually in the Hazardous Waste Generator Report for this facility based on Hazardous Waste Manifests.

6.2.2 The total pounds of product related to each waste stream will be divided by both the total pounds of undiluted waste generated and the total pounds of the waste stream. Both index numbers will be plotted for each year. In addition the projected index numbers will be plotted for the next two years.

6.2.3 The plotted values will be tracked and analyzed to determine the effectiveness of this plan.

6.2.4 Unless readily explained by well known operational factors, failure to maintain an decreasing average over any two years will be taken as a clear indication that a major revision of this plan is required.

6.3 Environmental Benefit of Waste Reduction Efforts - Aside from the benefits to Lenox of industrial waste minimization, federal and state legislation impose such efforts on manufacturing facilities. These benefits include:

6.3.1 An improved environment for Lenox, its employees, its customers and fellow citizens

6.3.2 Reductions in the quantity of hazardous materials purchased and used by Lenox China to manufacture its product has the consequence of reducing the quantity of

those materials in commerce. The risk of environmental releases of environmentally hazardous materials at all stages of mining, beneficiation, processing, storing and transporting are accordingly reduced thereby further ensuring a cleaner environment.

6.3.3 Improved public image and the ability to make a strong "green marketing" presentation to our customers

6.3.4 Source Elimination eliminates all of the costs to purchase, handle and dispose of the hazardous material and eliminates any risk of a release

6.3.5 Reduced costs for raw materials

6.3.6 Improved product yields

6.3.7 Reduced disposal costs

6.3.8 Reduced compliance and permitting costs

6.3.9 Reduced exposure to the risks of environmental releases

6.3.10 Avoidance of future clean-up costs.

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Company Name:	EPA I.D. Number

HAZARDOUS WASTE GENERATION SUMMARY

Table 1

Waste Stream I.D Number	Name of Waste	Source of Generation	Disposal Method	Quantity of Waste Generated (tons)				Indices (lb waste generated /lb product produced)				
				1990	1991	1992	1993	Then	1990	1991	1992	1993

GENSUMI

Company Name:	EPA I.D. Number

HAZARDOUS WASTE REDUCTION PROGRAM

Table 2

Waste Stream I.D. No.	Name of Waste	Waste Stream Affected	Reduction Plans/Projects	Estimated Waste Reduction (Tons)	Method Used to Calculate *ROI	ROI (est)	Goal Date	Remarks

*ROI = Return on investment
AC = Annualized cost
IRR = Internal rate of return
NPV = Net present value

PP = Pay back period
PI = Profitability index

GENSUMI

Firm	Waste Minimization Assessment	Prepared By
Site		Checked By
Date	Proj. No.	Sheet 1 of 1 Page ___ of ___

WORKSHEET 6

PROCESS INFORMATION

EPA

Process Unit/Operation: _____

Operation Type: ☐ Continuous ☐ Discrete ☐ Batch or Semi-Batch ☐ Other _____

Document	Status					
	Complete? (Y/N)	Current? (Y/N)	Last Revision	Used in this Report (Y/N)	Document Number	Location
Process Flow Diagram						
Material/Energy Balance						
Design						
Operating						
Flow/Amount Measurements						
Stream						
Analyses/Assays						
Stream						
Process Description						
Operating Manuals						
Equipment List						
Equipment Specifications						
Piping & Instrument Diagrams						
Plot and Elevation Plan(s)						
Work Flow Diagrams						
Hazardous Waste Manifests						
Emission Inventories						
Annual/Biennial Reports						
Environmental Audit Reports						
Permit/Permit Applications						
Batch Sheet(s)						
Materials Application Diagrams						
Product Composition Sheets						
Material Safety Data Sheets						
Inventory Records						
Operator Logs						
Production Schedules						

Firm	Waste Minimization Assessment	Prepared By
Site		Checked By
Date	Proj. No.	Sheet 1 of 1 Page __ of __

WORKSHEET 7

INPUT MATERIALS SUMMARY

EPA

Attribute	Description[1]		
	Stream No.____	Stream No.____	Stream No.____
Name/ID			
Source/Supplier			
Component/Attribute of Concern			
Annual Consumption Rate			
Overall			
Component(s) of Concern			
Purchase Price, $ per _____			
Overall Annual Cost			
Delivery Mode[2]			
Shipping Container Size & Type[3]			
Storage Mode[4]			
Transfer Mode[5]			
Empty Container Disposal/Management[6]			
Shelf Life			
Supplier Would			
- accept expired material (Y/N)			
- accept shipping containers (Y/N)			
- revise expiration date (Y/N)			
Acceptable Substitute(s), if any			
Alternate Supplier(s)			

1 stream numbers, if applicable, should correspond to those used on process flow diagrams.
2 e.g., pipeline, tank car, 100 bbl. tank truck, truck, etc.
3 e.g., 55 gal. drum, 100 lb. paper bag, tank, etc.
4 e.g., outdoor, warehouse, underground, aboveground, etc.
5 e.g., pump, forklift, pneumatic transport, conveyor, etc.
6 e.g., crush and landfill, clean and recycle, return to supplier, etc.

Site _____ Date _____ Proj. No. _____ Checked By _____ Sheet 1 of 1 Page ___ of ___

WORKSHEET 8

PRODUCTS SUMMARY

EPA

Attribute	Description[1]		
	Stream No.____	Stream No.____	Stream No.____
Name/ID			
Component/Attribute of Concern			
Annual Production Rate			
Overall			
Component(s) of Concern			
Annual Revenues, $ _____			
Shipping Mode			
Shipping Container Size & Type			
Onsite Storage Mode			
Containers Returnable (Y/N)			
Shelf Life			
Rework Possible (Y/N)			
Customer Would			
- relax specification (Y/N)			
- accept larger containers (Y/N)			

[1] stream numbers, if applicable, should correspond to those used on process flow diagrams.

Firm _____	Waste Minimization Assessment	Prepared By _____
Site _____		Checked By _____
Date _____	Proj. No. _____	Sheet 2 of 4 Page ___ of ___

WORKSHEET **9a**

INDIVIDUAL WASTE STREAM CHARACTERIZATION

EPA

1. **Waste Stream Name/ID:** _____ **Stream Number** _____
   Process Unit/Operation _____

2. **Waste Characteristics** (attach additional sheets with composition data, as necessary.)

   ☐ gas ☐ liquid ☐ solid ☐ mixed phase

   Density, lb/cuft _____ High Heating Value, Btu/lb _____
   Viscosity/Consistency _____
   pH _____ ,Flash Point _____ ; % Water _____

3. **Waste Leaves Process as:**
   ☐ air emission ☐ waste water ☐ solid waste ☐ hazardous waste

4. **Occurrence**
   ☐ continuous _____
   ☐ discrete _____
   discharge triggered by ☐ chemical analysis _____
   ☐ other (describe) _____
   Type: ☐ periodic _____ length of period: _____
   ☐ sporadic (irregular occurrence)
   ☐ non-recurrent

5. **Generation Rate**
   Annual _____ lbs per year
   Maximum _____ lbs per _____
   Average _____ lbs per _____
   Frequency _____ batches per _____
   Batch Size _____ average _____ range

Firm	Waste Minimization Assessment	Prepared By
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Date	Proj. No.	Sheet 2 of 4 Page ___ of ___

WORKSHEET 9b

INDIVIDUAL WASTE STREAM CHARACTERIZATION

(continued)

EPA

6. Waste Origins/Sources

Fill out this worksheet to identify the origin of the waste. If the waste is a mixture of waste streams, fill out a sheet for each of the individual waste streams.

Is the waste mixed with other wastes? ☐ Yes ☐ No

Describe how the waste is generated.

Example: Formation and removal of an undesirable compound, removal of an unconverted input material, depletion of a key component (e.g., drag-out), equipment cleaning waste, obsolete input material, spoiled batch and production run, spill or leak cleanup, evaporative loss, breathing or venting losses, etc.

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WORKSHEET 9c

INDIVIDUAL WASTE STREAM CHARACTERIZATION

(continued)

EPA

Waste Stream _____

7. Management Method

Leaves site in
- ☐ bulk _____
- ☐ roll off bins _____
- ☐ 55 gal drums _____
- ☐ other (describe) _____

Disposal Frequency _____

Applicable Regulations[1] _____

Regulatory Classification[2] _____

Managed
- ☐ onsite ☐ offsite
- ☐ commercial TSDF _____
- ☐ own TSDF _____
- ☐ other (describe) _____

Recycling
- ☐ direct use/re-use _____
- ☐ energy recovery _____
- ☐ redistilled _____
- ☐ other (describe) _____

reclaimed material returned to site?
- ☐ Yes ☐ No ☐ used by others

residue yield _____

residue disposal/repository _____

Note[1] list federal, state & local regulations, (e.g., RCRA, TSCA, etc.)

Note[2] list pertinent regulatory classification (e.g., RCRA - Listed K011 waste, etc.)

Firm _____	Waste Minimization Assessment	Prepared By _____
Site _____	Proc. Unit/Oper. _____	Checked By _____
Date _____	Proj. No. _____	Sheet 1 of 1 Page ___ of ___

WORKSHEET 10

WASTE STREAM SUMMARY

EPA

Attribute	Description[1]		
	Stream No. ____	Stream No. ____	Stream No. ____
Waste ID/Name:			
Source/Origin			
Component/or Property of Concern			
Annual Generation Rate (units_____)			
Overall			
Component(s) of Concern			
Cost of Disposal			
Unit Cost ($ per: _____)			
Overall (per year)			
Method of Management[2]			

Priority Rating Criteria[3]	Relative Wt. (W)	Rating (R)	R x W	Rating (R)	R x W	Rating (R)	R x W
Regulatory Compliance							
Treatment/Disposal Cost							
Potential Liability							
Waste Quantity Generated							
Waste Hazard							
Safety Hazard							
Minimization Potential							
Potential to Remove Bottleneck							
Potential By-product Recovery							
Sum of Priority Rating Scores		Σ(R x W)		Σ(R x W)		Σ(R x W)	
Priority Rank							

Notes: 1. Stream numbers, if applicable, should correspond to those used on process flow diagrams.

2. For example, sanitary landfill, hazardous waste landfill, onsite recycle, incineration, combustion with heat recovery, distillation, dewatering, etc.

3. Rate each stream in each category on a scale from 0 (none) to 10 (high).

Firm	Waste Minimization Assessment	Prepared By
Site	Proc. Unit/Oper.	Checked By
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WORKSHEET 11

OPTION GENERATION

EPA

Meeting format (e.g., brainstorming, nominal group technique) _____

Meeting Coordinator _____

Meeting Participants _____

List Suggested Options	Rationale/Remarks on Option

Firm _____	Waste Minimization Assessment	Prepared By _____
Site _____	Proc. Unit/Oper. _____	Checked By _____
Date _____	Proj. No. _____	Sheet 1 of 1 Page ___ of ___

WORKSHEET 12

OPTION DESCRIPTION

EPA

Option Name: _____

Briefly describe the option _____

_____

_____

_____

_____

_____

_____

_____

Waste Stream(s) Affected: _____

_____

Input Material(s) Affected: _____

_____

Product(s) Affected: _____

_____

Indicate Type:

☐ Source Reduction

___ Equipment-Related Change

___ Personnel/Procedure-Related Change

___ Materials-Related Change

☐ Recycling/Reuse

___ Onsite

___ Offsite

___ Material reused for original purpose

___ Material used for a lower-quality purpose

___ Material sold

___ Material burned for heat recovery

Originally proposed by: _____ Date: _____

Reviewed by: _____ Date: _____

Approved for study? _____ yes _____ no, by: _____

Reason for Acceptance or Rejection _____

Firm _____	Waste Minimization Assessment	Prepared By _____
Site _____	Proc. Unit/Oper. _____	Checked By _____
Date _____	Proj. No. _____	Sheet 1 of 1 Page 1 of 1

WORKSHEET
13

OPTIONS EVALUATION BY WEIGHTED SUM METHOD

EPA

Criteria	Weight (W)	Options Rating (R)									
		#1 Option		#2 Option		#3 Option		#4 Option		#5 Option	
		R	R x W	R	R x W	R	R x W	R	R x W	R	R x
Reduction in waste's hazard											
Reduction of treatment/disposal costs											
Reduction of safety hazards											
Reduction of input material costs											
Extent of current use in industry											
Effect on product quality (no effect = 10)											
Low capital cost											
Low O & M cost											
Short implementation period											
Ease of implementation											
Final Evaluation: Sum of Weighted Ratings Σ (W x R)											
Final Evaluation: Option Ranking											
Feasibility Analysis Scheduled for (Date)											

Firm	Waste Minimization Assessment	Prepared By
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WORKSHEET 14a

TECHNICAL FEASIBILITY

EPA

WM Option Description _____

1. Nature of WM Option
   - ☐ Equipment-Related
   - ☐ Personnel/Procedure-Related
   - ☐ Materials-Related
2. If the option appears technically feasible, state your rationale for this. _____

Is further analysis required? ☐ Yes ☐ No. If yes, continue with this worksheet. If not, skip to worksheet 15.

3. Equipment - Related Option

	YES	NO	
Equipment available commercially?	☐	☐	_____
Demonstrated commercially?	☐	☐	_____
In similar application?	☐	☐	_____
Successfully?	☐	☐	_____

Describe closest industrial analog _____

Describe status of development _____

Prospective Vendor	Working Installation(s)	Contact Person(s)	Date Contacted 1.

1. Also attach filled out phone conversation notes, installation visit report, etc.

Firm	Waste Minimization Assessment	Prepared By
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WORKSHEET 14b

TECHNICAL FEASIBILITY

(continued)

EPA

WM Option Description _____

3. Equipment-Related Option (continued)

Performance information required (describe parameters): _____

Scaleup information required (describe): _____

Testing Required: ☐ yes ☐ no

Scale: ☐ bench ☐ pilot ☐ _____

Test unit available? ☐ yes ☐ no _____

Test Parameters (list) _____

Number of test runs: _____

Amount of material(s) required: _____

Testing to be conducted: ☐ In-plant

☐ _____

Facility/Product Constraints:

Space Requirements _____

Possible locations within facility _____

Firm	Waste Minimization Assessment	Prepared By
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WORKSHEET 14c

TECHNICAL FEASIBILITY (continued)

EPA

WM Option Description _____

2. Equipment-Related Option (continued)

Utility Requirements:

Electric Power	Volts (AC or DC) _____	kW _____
Process Water	Flow _____	Pressure _____
	Quality (tap, demin, etc.) _____	
Cooling Water	Flow _____	Pressure _____
	Temp. In _____	Temp. Out _____
Coolant/Heat Transfer Fluid	_____	
	Temp. In _____	Temp. Out _____
	Duty _____	
Steam	Pressure _____	Temp. _____
	Duty _____	Flow _____
Fuel	Type _____	Flow _____
		Duty _____
Plant Air	_____	Flow _____
Inert Gas	_____	Flow _____

Estimated delivery time (after award of contract) _____

Estimated installation time _____

Installation dates _____

Estimated production downtime _____

Will production be otherwise affected? Explain the effect and impact on production. _____

Will product quality be affected? Explain the effect on quality. _____

Firm _____	Waste Minimization Assessment	Prepared By _____
Site _____	Proc. Unit/Oper. _____	Checked By _____
Date _____	Proj. No. _____	Sheet 4 of 6 Page ___ of ___

WORKSHEET 14d

TECHNICAL FEASIBILITY

(continued)

EPA

WM Option Description _____

3. Equipment-Related Option (continued)

Will modifications to work flow or production procedures be required? Explain. _____

Operator and maintenance training requirements

Number of people to be trained _____ ☐ Onsite

_____ ☐ Offsite

Duration of training

Describe catalyst, chemicals, replacement parts, or other supplies required.

Item	Rate or Frequency of Replacement	Supplier, Address

Does the option meet government and company safety and health requirements?

☐ Yes ☐ No Explain _____

How is service handled (maintenance and technical assistance)? Explain _____

What warranties are offered? _____

Firm	Waste Minimization Assessment	Prepared By
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WORKSHEET 14e

TECHNICAL FEASIBILITY

(continued)

EPA

WM Option Description _____

3. Equipment-Related Option (continued)

Describe any additional storage or material handling requirements. _____

Describe any additional laboratory or analytical requirements. _____

4. Personnel/Procedure-Related Changes

Affected Departments/Areas _____

Training Requirements _____

Operating Instruction Changes. Describe responsible departments. _____

5. Materials-Related Changes (Note: If substantial changes in equipment are required, then handle the option as an equipment-related one.)

	Yes	No
Has the new material been demonstrated commercially?	☐	☐
In a similar application?	☐	☐
Successfully?	☐	☐

Describe closest application. _____

Firm _____	Waste Minimization Assessment	Prepared By _____
Site _____	Proc. Unit/Oper. _____	Checked By _____
Date _____	Proj. No. _____	Sheet 6 of 6 Page ___ of ___

WORKSHEET 14f

TECHNICAL FEASIBILITY

(continued)

EPA

WM Option Description _____

4. Materials-Related Changes (continued)

Affected Departments/Areas _____

Will production be affected? Explain the effect and impact on production.

Will product quality be affected? Explain the effect and the impact on product quality.

Will additional storage, handling or other ancillary equipment be required? Explain.

Describe any training or procedure changes that are required.

Decribe any material testing program that will be required.

Firm	Waste Minimization Assessment	Prepared By
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WORKSHEET 15a

COST INFORMATION

EPA

WM Option Description _____

CAPITAL COSTS - Include all costs as appropriate. TOTALS

☐ Purchased Process Equipment

- Price (fob factory) _____
- Taxes, freight, insurance _____
- Delivered equipment cost _____
- Price for initial Spare Parts Inventory _____ _____

☐ Estimated Materials Cost

- Piping _____
- Electrical _____
- Instruments _____
- Structural _____
- Insulation/Piping _____ _____

☐ Estimated Costs for Utility Connections and New Utility Systems

- Electricity _____
- Steam _____
- Cooling Water _____
- Process Water _____
- Refrigeration _____
- Fuel (Gas or Oil) _____
- Plant Air _____
- Inert Gas _____ _____

☐ Estimated Costs for Additional Equipment

- Storage & Material Handling _____
- Laboratory/Analytical _____
- Other _____ _____

☐ Site Preparation _____

(Demolition, site clearing, etc.) _____

☐ Estimated Installation Costs

- Vendor _____
- Contractor _____
- In-house Staff _____ _____

Site _____	Proc. Unit/Oper. _____	Checked By _____
Date _____	Proj. No. _____	Sheet 2 of 6 Page ___ of ___

WORKSHEET 15b

COST INFORMATION

(continued)

EPA

CAPITAL COSTS (Cont.) — TOTALS

☐ Engineering and Procurement Costs (In-house & outside)

- Planning _____
- Engineering _____
- Procurement _____
- Consultants _____ _____

☐ Start-up Costs

- Vendor _____
- Contractor _____
- In-house _____ _____

☐ Training Costs _____ _____

☐ Permitting Costs

- Fees _____
- In-house Staff Costs _____ _____

☐ Initial Charge of Catalysts and Chemicals

- Item #1 _____
- Item #2 _____ _____

☐ Working Capital [Raw Materials, Product, Inventory, Materials and Supplies (not elsewhere specified)].

- Item #1 _____
- Item #2 _____
- Item #3 _____
- Item #4 _____ _____

☐ Estimated Salvage Value (If any) _____

Firm	Waste Minimization Assessment	Prepared By
Site	Proc. Unit/Oper.	Checked By
Date	Proj. No.	Sheet 3 of 6 Page ___ of ___

WORKSHEET 15c

COST INFORMATION

(continued)

EPA

CAPITAL COST SUMMARY

Cost Item	Cost
Purchased Process Equipment	
Materials	
Utility Connections	
Additional Equipment	
Site Preparation	
Installation	
Engineering and Procurement	
Start-up Cost	
Training Costs	
Permitting Costs	
Initial Charge of Catalysts and Chemicals	
Fixed Capital Investment	
Working Capital	
Total Capital Investment	
Salvage Value	

Firm	Waste Minimization Assessment	Prepared By
Site	Proc. Unit/Oper.	Checked By
Date	Proj. No.	Sheet 4 of 6 Page ___ of ___

WORKSHEET 15d

COST INFORMATION (continued)

EPA

☐ Estimated Decrease (or Increase) in Utilities

Utility	Unit Cost $ per unit	Decrease (or Increase) in Quantity Unit per time	Total Decrease (or Increase) $ per time
Electricity			
Steam			
Cooling Process			
Process Water			
Refrigeration			
Fuel (Gas or Oil)			
Plant Air			
Inert Air			

INCREMENTAL OPERATING COSTS - Include all relevant operating savings. Estimate these costs on an incremental basis (i.e., as decreases or increases over existing costs).

☐ BASIS FOR COSTS Annual ____ Quarterly ____ Monthly ____ Daily ____ Other____

☐ Estimated Disposal Cost Saving

Decrease in TSDF Fees ____

Decrease in State Fees and Taxes ____

Decrease in Transportation Costs ____

Decrease in Onsite Treatment and Handling ____

Decrease in Permitting, Reporting and Recordkeeping ____

Total Decrease in Disposal Costs ____

☐ Estimated Decrease in Raw Materials Consumption

Materials	Unit Cost $ per unit	Reduction in Quantity Units per time	Decrease in Cost $ per time

Firm	Waste Minimization Assessment	Prepared By
Site	Proc. Unit/Oper.	Checked By
Date	Proj. No.	Sheet 5 of 6 Page ___ of ___

WORKSHEET 15e

COST INFORMATION

(continued)

EPA

☐ Estimated Decrease (or Increase) in Ancillary Catalysts and Chemicals

Catalyst/Chemical	Unit Cost $ per unit	Decrease (or Increase) in Quantity Unit per time	Total Decrease (or Increase) $ per time

☐ Estimated Decrease (or Increase) in Operating Costs and Maintenance Labor Costs (include cost of supervision, benefits and burden).

☐ Estimated Decrease (or Increase) in Operating and Maintenance Supplies and Costs.

☐ Estimated Decrease (or Increase) in Insurance and Liability Costs (explain).

☐ Estimated Decrease (or Increase) in Other Operating Costs (explain).

INCREMENTAL REVENUES

☐ Estimated Incremental Revenues from an Increase (or Decrease) in Production or Marketable By-products (explain).

Firm _____	Waste Minimization Assessment	Prepared By _____
Site _____	Proc. Unit/Oper. _____	Checked By _____
Date _____	Proj. No. _____	Sheet 6 of 6 Page ___ of ___

WORKSHEET
15 f

COST INFORMATION

(continued)

EPA

INCREMENTAL OPERATING COST AND REVENUE SUMMARY (ANNUAL BASIS)

Decreases in Operating Cost or Increases in Revenue are Positive.
Increases in Operating Cost or Decrease in Revenue are Negative.

Operating Cost/Revenue Item	$ per year
Decrease in Disposal Cost	
Decrease in Raw Materials Cost	
Decrease (or Increase) in Utilities Cost	
Decrease (or Increase) in Catalysts and Chemicals	
Decrease (or Increase) in O & M Labor Costs	
Decrease (or Increase) in O & M Supplies Costs	
Decrease (or Increase) in Insurance/Liabilities Costs	
Decrease (or Increase) in Other Operating Costs	
Incremental Revenues from Increased (Decreased) Production	
Incremental Revenues from Marketable By-products	
Net Operating Cost Savings	

Hazardous Waste Reduction Plan (HWRP) Requirements Checklist
(FOR THE PREPARER)

The Hazardous and Solid Waste Amendments of 1984 require that generators of hazardous waste "have a program in place to reduce the volume and toxicity of waste generated to the extent that is economically practicable." The HWRP is the Permittee's waste minimization program and is intended to be an organized, comprehensive, and continual effort to systematically reduce waste generation. A component of a HWRP may include specific projects and may use waste minimization assessments as a tool for determining where and how waste can be reduced. The HWRP should reflect the goals and policies for waste minimization set by management. A waste minimization program should be an on-going effort and strive to make waste minimization part of the company's operating philosophy.

This checklist is based on the EPA guidance document, Waste Minimization Opportunity Assessment Manual. The Work Sheets referenced in this checklist are contained in this manual. (There are numerous Work Sheets in the manual that are also useful, but not referenced in this checklist.) The preparer of the HWRP is encouraged to consult this manual and other relevant guidance documents in designing a HWRP.

Requirement	Description
1. Waste minimization efforts already implemented or on-going at facility a. Description of waste minimization activities since 1984. Include information on effectiveness of program in terms of waste generation and cost reduction achieved. b. On-going waste minimization program: description of current program and projected waste or toxicity reduction. c. Projections of waste generation and waste minimization for next five years.	1. This section should be used to summarize the waste minimization results of the previous year and describe changes (if any) to the Permittee's waste minimization program. The Permittee should provide a reasonable projection of next year's waste minimization objectives. The projections should be based on the waste minimization assessments discussed in Section 3. A five-year projection is desired, but not required. (The more accurate the projection the more efficient waste minimization program can be planned.) This section can be viewed as an introduction to the HWRP--i.e., the Permittee's waste minimization program.

2. Characterization of waste generation

(Consult the Waste Minimization Opportunity Assessment Manual, EPA/625/7-88/003 and the New York Waste Reduction Guidance, March 1989.)

a. Specify the Permittee's industry group code.

b. Provide a description of the Permittee's waste accounting system. (Waste information should include, at a minimum, the waste types, amount, toxic components or hazardous constituents contained in the waste, chemical and physical characteristics, and dates generated.)

c. Provide block and/or flow diagrams of the unit processes depicting the subject waste streams and methods of waste management.

d. Identification of waste streams. (The preparer should refer to Work Sheets #6, #7, #8, #9 and #10 in the Waste Minimization Opportunity Assessment Manual for the type of information.)

- Hazardous waste streams (as defined under RCRA)
- Rationale for the material being a hazardous waste

e. Prioritize the waste streams for waste minimization in accordance to the following criteria: (1) acute hazardous waste, (2) non-acute hazardous waste streams greater than 5 tons during the previous year or which accounts for at least 90% of all hazardous waste generated at the facility, and (3) remaining hazardous waste streams.

f. Propose an "index" that relates hazardous waste generation to production. If waste stream cannot be related to in this manner, then propose other method of measuring the attainment of waste minimization objectives. (Consult the New York Waste Reduction Guidance, March 1989, Appendix A.)

2. This section should be used to identify and describe the hazardous wastes generated and targeted for waste minimization efforts. Knowledge of the wastes generated and the amount is essential in the development of a waste minimization program.

The Permittee should describe its waste accounting system or protocol designed to track waste generation by weight or volume. (Implementing a waste inventory system would lead to more efficient use of material, thus reducing the quantity of expired and unused material to be discarded.)

All hazardous waste streams subject to waste minimization should be identified. Simple block or flow diagrams identifying the waste streams should be included. (Note that a detailed flowsheet is generally not required, but may be included.) The Permittee should also determine whether the waste stream is hazardous because of being mixed with a hazardous waste stream. If it is, then a waste minimization option that must be considered in Section 3 shall be the segregation of the waste streams.

Upon developing an inventory list of the affected waste streams, the waste streams must be ranked by listing the streams in accordance to quantity generated in a year. The purpose of the ranking is to prioritize waste streams for aggressive waste minimization efforts. A phased approach in assessing the waste streams may be used.

Propose an "index" for measuring waste minimization progress. The Permittee should explore the use of various "indices" to obtain an effective "index" to measure waste minimization progress and effectiveness. Examples: quantity waste reduction per unit product produced (including rejected products) or raw material used. For complex cases where it is difficult to propose an "index", provide an explanation. (The intent is to develop an effective method to measure waste minimization progress.)

3. Assessment of waste minimization opportunities

a. Options Screened for Further Study. (Preparer should refer to Work Sheet #13.)

b. Demonstrate that the following categories of waste reduction options were considered. Preparer should refer to Work Sheets #11 and #12.

(Consult New York State Waste Reduction Guidance Manual, March 1989 and relevant industry-specific material.)

- Source reduction
  - Equipment-related changes (e.g., segregation of waste streams, improvement in process, up-grading equipment)
  - Consider improvement to existing waste minimization program.
  - Describe protocol to review the processes and facility periodically for up-grade and improvement opportunities.
  - Personnel/Procedure-Related changes (e.g., house-keeping improvements, preventive maintenance)
  - Materials-related changes (e.g., improved inventory control, raw material substitution)

- Recycling/reuse
  - reuse for original purpose (e.g., close-loop reclamation)
  - use for lower-quality purpose
  - sell or exchange material (e.g., Waste Exchanges)
    - Which Waste Exchange(s) did Permittee consult?

c. Feasibility Study of Options Resulting From the Screening:

- Technical evaluation --Preparer should refer to Work Sheet #14.

- Economic evaluation--Preparer should refer to Work Sheets #15, #16, and #17.

3. This Section should be used to describe the results of the waste minimization opportunities assessment for each subject waste stream.

To facilitate conducting a waste minimization opportunity assessment, it is recommended that the Permittee "track" the material that eventually winds up as waste--i.e., from loading dock to designating the material as "waste" and assess various points in the process for waste minimization. In addition, for facilities with an existing waste minimization program, one option that must be considered is improvement to the existing waste minimization activity. In the evaluation of options, the Permittee should consider various viable options. A source for such options can be national waste minimization databases, industry journals, EPA Office of Pollution Prevention, or universities.

For waste streams which must be assessed, but has not been assessed yet, provide a schedule to conduct the assessment.

The Permittee is not required to submit all information generated in the assessment process--only a summary of the assessment method and the results of the assessment. However, data relevant to the technical evaluation and feasibility study should be maintained on-site and made available upon request by EPA or state.

(The information submitted should be adequate to demonstrate that the items specified under Section 3 is addressed.)

- Determination of true cost of waste
  - Consider cost of material found in waste stream based on purchase price
  - Consider cost of managing the waste: personnel, recordkeeping, transportation, liability insurance, pollution control, treatment and disposal, and compliance with regulations

- Does the selected option satisfy the following technical standards:

  - Apply generally accepted engineering, scientific or economic principles and practices.

  - Achievement of waste reduction must not be by transference to other environmental media without an environmental benefit from such transference.

  - Be consistent with the following hazardous waste management practices hierarchy: (1) source reduction, (2) recycling, (3) treatment, and then (4) disposal.

  - Does not involve conduct which is prohibited by any applicable law or regulation.

  - Provide a basis for charting waste reduction trends over time.

  - Apply those technically and economically feasible release reduction alternatives which are most effective in reducing the volume or toxicity of waste.

(Table 1--Summary chart showing waste streams and selected options.)

4. Implementation of waste minimization

   a. Description of implementation procedures
      - Activities and equipment needed to implement HWRP

   b. Provide a detailed schedule showing critical milestones.

   c. Demonstrate a commitment of resources for implementing those technically and economically feasible waste reduction alternatives identified by the generator according to the time schedule developed.

4. This section should be used to describe implementation of the selected option, a schedule to implement the selected options, and/or a schedule to complete the assessment of remaining subject waste streams. (Section 4 may be combined with Section 3.)

5. Encouraging technology transfer

   a. Description of company protocol for internal exchange of information.

   b. Description of external exchange of information--e.g., EPA (e.g., EIES Database), State, universities, consultants.

   c. Description of training program to ensure that employees involved in waste minimization are kept current in waste minimization technologies.

5. This section should be used to describe the method of technology transfer. The description should address how personnel involved with waste minimization obtain relevant training, how relevant information is transferred in-house, how waste minimization suggestions are obtained and implemented, and how information is up-dated.

   It is recommended that the Permittee have access to EPA's (or other) waste minimization databases. Regular contact with EPA and/or state is encouraged to obtain new information. Industry journal is also a good source of obtaining new information on waste minimization.

   For facilities with limited staff, there should be an appointed waste minimization "coordinator" who will be responsible for managing consultant/contractor support.

   A waste minimization component may be incorporated into the Permittee's hazardous waste training program. Training of in-house waste minimization team should include a course on conducting waste minimization opportunity assessments.

6. Provision to conduct program evaluation

a. Description of protocol for periodic review of program effectiveness.

b. Waste minimization progress should be tracked and evaluated.

It may be in the form of an annual report to Region II--(Information to be included: Permittee's industrial group by SIC code, projected waste generation, actual waste generation, wastes reduced by implementation of waste reduction program, measurement of waste reduction (index), selected waste reduction technology, time frame covered by the annual report, difference in actual waste generation and projected waste generation and reason, and recommended changes to projection.)

- Does Waste Reduction Impact Statement demonstrate progress in waste reduction efforts employing the method of measurement specified in the plan?

6. This section should be used for describing the Permittee's schedule and method of evaluating its waste minimization program. It is recommended that its waste minimization program be evaluated at least every two years. The projections (Section 1 and 7) and annual reports should be considered in the evaluation. The Permittee should propose a criteria by which the waste minimization plan is deemed ineffective and, therefore, changes to the plan must be considered. (The criteria may be based on the Permittee's waste reduction projections and achievement as indicated by the annual report.)

7. Waste Minimization Scope and Objectives and Demonstration of Top-level Management Support

a. Set specific goals and objectives (short term and long term) for hazardous waste volume and/or toxicity reduction.

b. Demonstrate top-level management commitment to waste minimization.

c. Description of method(s) used to accomplish top-level management support: e.g., reward and recognition program, waste minimization suggestion program.

d. Is there a designated waste minimization department or team whose responsibility includes waste minimization?

e. Is there a statement of its commitment to implement recommendations resulting from waste minimization assessments?

f. Cost allocation
- Are departments and managers charged "fully-loaded" waste management cost factoring in liability, compliance, and oversight?
- Is budget to carry out waste minimization program adequate?

7. This section should be used to demonstrate top-level management support and to describe the managerial aspects of the waste minimization program (e.g., identify the designated waste minimization team or coordinator). Management support may be demonstrated by policy statement or directive committing the company to pursue waste minimization and declare its commitment to implement recommendations resulting from waste minimization assessments. (A company organization chart should be included.)

This section should discuss the Permittee's short-term and long-term objectives. (This should be consistent with Section 1.)

The Permittee should also describe how funding is allocated for implementation of the waste minimization program.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION II

JACOB K. JAVITS FEDERAL BUILDING

NEW YORK, NEW YORK 10278

FEB 11 1992

Mr. Stephen F. Lichenstein,
Sr. Vice President, Secretary
and General Counsel
Lenox Incorporated
100 Lenox Drive
Lawrenceville, New Jersey 08648

Re: Lenox China, Inc., Tilton Road, Pomona, New Jersey
EPA I.D. Number: NJD002325074

Dear Mr. Lichenstein:

This is in response to your facsimile transmittal dated January 4, 1993 in which you requested clarification of the due date of the Hazardous Waste Reduction Plan (HWRP) required by the above referenced facility's permit which was issued pursuant to the Resource Conservation and Recovery Act (RCRA) Hazardous and Solid Waste Amendments of 1984 (HSWA). In subsequent conversation with Patricia Pechko, of my staff, you also requested clarification of the Environmental Protection Agency's (EPA) coordination with New Jersey's Pollution Prevention Act.

Paragraph C of Module IV (Waste Minimization) of the Lenox China, Pomona HSWA Permit states "The Permittee shall submit a HWRP by July 1, of the first year following permit issuance..." As previously discussed with Ms. Pechko, on January 21, 1992, the HWRP would be due July 1, 1993 since the effective date of the permit is December 1, 1992.

EPA is aware of and appreciates the implications of the pending Pollution Prevention Plan (PPP) Lenox China will be submitting under the auspices of New Jersey's Pollution Prevention Act. Similarities may exist between what will be required of you under New Jersey's Act and EPA's HWRP requirements, however, please keep in mind that the required HWRP is based on RCRA and HSWA.

The HWRP minimum review standards were developed prior to, and independent of, New Jersey requirements. Therefore, the fact that Lenox will be required to submit a PPP in two years does not alleviate any HWRP reporting requirements at this time. In addition, there is no inconsistency between the HWRP and PPP requirements because the data developed by Lenox for the HWRP will be critically useful to the PPP as well.

HWRP requirements do not require the sharing of confidential process information. This type of confidential information is a New Jersey Pollution Prevention Act requirement. The requirements of the Pollution Prevention Act only apply to chemicals reported under Section 313 of the Emergency Planning and Community Right to Know Act (Title III of the Superfund Amendments and Reauthorization Act of 1986) which are manufactured or used in quantities exceeding 10,000 lbs. on a facility level. The HWRP pertains in any quantity only to hazardous waste generated at the Pomona facility.

I hope this clarifies differences between the HWRP and the New Jersey PPP. As previously mentioned, at such a time when a PPP is prepared, and approved by NJDEPE, a separate plan will not be needed to satisfy the requirements to prepare a HWRP. We look forward to receiving your HWRP by July 1, 1993.

If you have any questions, please contact Patricia Pechko, of my staff, at (212) 264-7462.

Sincerely yours,

Michael Poetzsch, P.E.
Chief, New Jersey/Caribbean Permits Section

MODULE IV - WASTE MINIMIZATION

A. SUBMITTAL REQUIREMENTS. Pursuant to 40 C.F.R. § 264.73(b)(9), and Section 3005(h) of the Act, 42 U.S.C. § 6925(h), the Permittee must submit to the Regional Administrator, at least annually, a waste minimization report by the owner or operator. This report and all accompanying documentation will be submitted by July 1 of each year after the effective date of this Permit.

B. WASTE MINIMIZATION REPORT. The Permittee must certify that:

1. A program is in place to reduce the volume and toxicity of hazardous waste generated to the degree determined by the Permittee to be economically practicable; and

2. The proposed method of treatment, storage or disposal is that practicable method currently available to the Permittee which minimizes the present and future threat to human health and the environment.

C. HAZARDOUS WASTE REDUCTION PLAN (HWRP). The Permittee shall submit a HWRP by July 1 of the first year following permit issuance. The HWRP shall be updated at least biennially to reflect changes in the HWRP, and submitted by July 1 of that year. The HWRP shall include at a minimum, the following information:

1. Identify amounts and types of all acute hazardous waste generated by waste stream.

2. Identify amounts and types of non-acute hazardous waste by waste stream for streams greater than five (5) tons and,

3. Identify at least 90% of all non-acute hazardous waste generated at the facility.

4. Describe source of generation and waste management method for each waste stream.

5. Provide list of technically feasible and economically practicable waste reduction measures.

6. Provide a program plan and schedule for implementing technically feasible and economically practicable waste reduction over time.

The following guidance documents should be used in developing the HWRP:

Waste Minimization Opportunity Assessment Manual, EPA/625/7-88/003, July 1988. Available through: EPA, Office of Research and Development, Cincinnati, Ohio 45268, tel. 513/569-7562 or NTIS, 5285 Port Royal Road, Springfield, VA 22161, tel. 703/487-4600.

Region II HWRP Requirements. Available through EPA Region II, Hazardous Waste Facilities Branch, Andrew Bellina, tel. 212/264-0505.

New York State Waste Reduction Guidance Manual March 1989.

New York State Waste Reduction Guidance Manual Supplement, December 1990. Available through the New York State Department of Environmental Conservation, Bureau of Pollution Prevention, 50 Wolf Road, Albany, New York 12233-7253, tel. 518/485-8400.

D. IMPLEMENTATION OF WASTE REDUCTION TECHNIQUES.
The Permittee shall implement the feasible waste reduction techniques in accordance with the schedule in the HWRP.

NYS DEPT OF ENVIRONMENTAL CONSERVATION
DIV OF HAZARDOUS SUBSTANCES REGULATION
BUREAU OF POLLUTION PREVENTION

CHECKLIST OF ITEMS TO BE SUBMITTED AS PART OF HAZARDOUS WASTE REDUCTION PLANS (HWRP)

The following information must be submitted as part of HWRP*:

1. Identify amounts and types of all acute hazardous waste generated by waste stream.

2. Identify amounts and types of non-acute hazardous waste by waste stream for waste streams greater than five (5) tons.

3. Identify at least 90% of all non-acute hazardous waste generated at the facility.

4. Describe source of generation and waste management method for each waste stream.

* Detailed guidance on each item is provided in Guidance Document. Additional information is available by calling 800-462-6553 or 518-485-8400.

February 1991

5. Submit block diagram of the process(es) generating the waste (include at a minimum raw material inputs, major process steps/equipment, and product/waste outputs).

6. Submit index relating hazardous waste to production or some other index.

7. Submit cost for managing each waste stream.

8. For each waste stream, submit an evaluation of:

   - substitution of non-toxic or less toxic inputs,
   - reformulation or redesign of end products to eliminate production inputs,
   - modification or redesign of production processes/equipment,
   - changes in materials usage, handling and storage practices,
     etc.,
   - use of closed loop reclamation, reuse or recycling processes to recycle wastes directly back into production process, and
   - use of on-site or off-site recycling technologies.

9. Submit return on investment number in accordance with NYS Waste Reduction Guidance Manual for technically feasible options identified in No. 8.

10. Provide list of technically feasible and economically practicable waste reduction measures.

11. Submit description of corporation's or facility's waste reduction policy. This should include; specific goals and objectives (short term and long term) for hazardous waste volume and/or toxicity reduction; statement of top-level management commitment to waste minimization; method(s) used to accomplish top-level management support (e.g., reward and recognition program); designation of waste minimization department or team responsible for implementing waste reduction plan; and a statement of commitment to implement recommendations resulting from waste minimization assessments.

12. Provide schedule for implementing technically feasible and economically practicable waste reduction actions.

13. Provide description of method to be used for measuring waste reduction over time.

14. Provide description of employee training program.

15. Provide estimate of anticipated reduction, by waste stream, as a result of implementing waste reduction plan.

16. Provide estimate of the extent of transference of hazardous waste to other media as result of implementing plan and the associated overall environmental benefits.

17. Submit completed Table 1.

18. Submit completed Table 2.